WHAT IS CLAIMED IS:

1. A method for ex vivo expansion of stem cells, comprising the steps of;

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(a) culturing said stem cells with a selected growth medium comprising a chimera protein having the formula selected from the group consisting of:

10 R_1-L-R_2 , $R_2-L R_1$, R_1-R_2 , R_2-R_1 , R_1-L-R_1 and

wherein R_1 is a human interleukin-3 mutant polypeptide of SEQ ID NO:1

15 wherein

Xaa at position 17 is Ser, Lys, Gly, Asp, Met, Gln, or Arg;

Xaa at position 18 is Asn, His, Leu, Ile, Phe, Arg, or Gln;

Xaa at position 19 is Met, Phe, Ile, Atp, Gly, Ala, or Cys;

Xaa at position 20 /is Ile, Cys \ Gln, Glt, Arg, Pro, or Ala;

20 Xaa at position 21 is Asp, Phe, Lys, Arg Ala, Gly, Glu,

Gln, Ash, Thr, Ser or Val;

Xaa at position 22 is Glu, Trp, Pro, Ser, Ala, His, Asp,

Asn, Gln, Leu, Val or Gly;

Xaa at position 23 is Ne, Val, Ala, Yeu, Gly, Trp, Lys,

25 Phe, Ser, or Arg;

Xaa at position 24 is Ile, Gly, Val, Arg, Ser, Phe, or Leu;

Xaa at position 25 is Thr, His, Gly, Gln, Arg, Pro, or Ala;

Xaa at position 26 is His, Thr, Phe, Gly, Arg, Ala, or Trp;

Xaa at position 27 is Leu, Gly, Arg, Thr, Ser, or Ala;

30 Xaa at position 28 is Lys, Arg, Leu, Gln, Gly, Pro, Val or Trp;

Xaa at position 29 is Gln, Asn, Leu, Pro, Arg, or Val;

Xaa at position 30 is Pro, His, Thr, Gly, Asp, Cln, Ser, Leu, or Lys;

Xaa at position 31 is Pro, Asp, Gly, Ala, Arg, Leu or Gln;

35 Xaa at position 32 is Leu, Val, Arg, Gln, Asn, Gly, Ala, or Glu;

Xaa at position 33 is Pro, Leu, Gln, Ala, Thr, or Glu; Xaa at position 34 is Leu, Val, Gly, Ser, Lys, Glu, Glu,

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Thr, Arg, Ala, Phe, Ile or Met;
      Xaa at position 35 is Leu, Ala, Gly, Asn, Pro, Gln, or Val;
      Xaa at position 36 is Asp, Leu, or Val;
      Xaa at position \37 is Phe, Ser, Pro, Trp, or Ile;
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      Xaa at position \ 8 is Asn, or Ala;
      Xaa at position 4 v is Leu, Trp, or Arg;
      Xaa at position 41\is Asn, Cys, Arg, Leu, His, Met, or Pro;
      Xaa at position 42 \is Gly, Asp, Ser, Cys, Asn, Lys, Thr,
                  Leu, Val, Glu, Phe, Tyr, Ile, Met or Ala;
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      Xaa at position 43 is Glu, Asn, Tyr, Leu, Phe, Asp, Ala,
                  Cys, Gln, Arg, Thr, Gly or Ser;
      Xaa at position 44 is Asp, Ser, Lou, Arg, Lys, Thr, Met,
                  Trp, Elu, Aan, Gln, Ala or Pro;
      Xaa at position 45 is Glm, Pro, Phe, Val, Met, Leu, Thr,
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                  ∠ys, Trp, Asp,\ Asn, Arg, Ser, \A\a, Ile, Glu or His;
      Xaa at posicion 46 is Asp, \Phe, Ser, Thr, | cys\ Glu, Asn,
                  Gln, Lys, His, Ala, Tyr, Ile, Val or Gly;
      Xaa at position 47 is Ile, Gly, Val, Ser, Art, Pro, or His;
      Xaa at position 48 is Leu, Ser, Cys, Arg, Ile, His, Phe,
20
                  Glu, Lys, Thr, Ala, Met, Val or Asn;
     Xaa at position 49 is Met, Arg, \Ala, Gly, Pro, \Asn, His, or Asp;
     Xaa at position 50 is Glu, Leu, Thr, Asp, Tyr, Lys, Asn,
                  Ser Ala, Ile, Val, Has, Phe, Met of Gln;
     Xaa at position 51 is Asn, Arg, Met, Pro, Ser, Thr, or His;
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     Xaa at position 52 is Asn, His, Arg Leu, Gly, Ser, or Thr;
     Xaa at position 53 is Leu, Thr, Ala, Gly, Glu, Pro, Lys,
                  Ser, or Met;
     Xaa at position 54 is Arg, Asp, Ile, Ser, Val, Thr, Gln,
                 Asn, Lys, His, Ala or Leu;
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     Xaa at position 55 is Arg, Thr, Val, Ser\ Leu, or Gly;
     Xaa at position 56 is Pro, Gly, Cys, Ser, Gln, Glu, Arg,
                 His, Thr, Ala, Tyr, Phe, Leu, Val or Lys;
     Xaa at position 57 is Asn or Gly;
     Xaa at position 58 is Leu, Ser, Asp, Arg, Glp, Val, or Cys;
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     Xaa at position 59 is Glu, Tyr, His, Leu, Prd, or Arg;
     Xaa at position 60 is Ala, Ser, Pro, Tyr, Asn \ or Thr;
     Xaa at position 61 is Phe, Asn, Glu, Pro, Lys, Arg, or Ser;
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Xaa at position 62 is Asn, His, Val, Arg, Pro, Thr, Asp, or Ile;
      Xaa at position\63 is Arg, Tyr, Trp, Lys, Ser, His, Pro, or Val;
      Xaa at position §4 is Ala, Asn, Pro, Ser, or Lys;
      Xaa at position 65 is Val, Thr, Pro, His, Leu, Phe, or Ser;
  5
      Xaa at position 66\is Lys, Ile, Arg, Val, Asn, Glu, or Ser;
      Xaa at position 67 \undersigned s Ser, Ala, Phe, Val, Gly, Asn, Ile, Pro, or
                  His:
      Xaa at position 68 is Leu, Val, Trp, Ser, Ile, Phe, Thr, or His;
      Xaa at position 69 is Gln, Ala, Pro, Thr, Glu, Arg, Trp, Gly, or
 10
                  Leu;
      Xaa at position 70 is Asn, Leu, Val, Trp, Pro, or Ala;
      Xaa at position 71 is Ala, Met, Leu, Pro, Arg, Glu, Thr,
                  Gln, Trp, or \Asn;
      Xaa at position 72 is Ser Glu, Met, Ala His, Asn, Arg, or Asp;
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      Xaa at position 73 is Ala, Glu, Asp, Leu, Ser, Gly, Thr, or Arg;
      Xaa at position 74 is Ile, Met, Thr, Pro Atg, Gly, Ala;
      Xaa at position 75 is Glu, Lys, Gly, Asp∥ Prd, Trp, Arg,
                  Ser, Gln, or Let;
     Xaa at position 76 is Ser, Val, Ala, Asn, Trp, Glu, Pro, Gly, or
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                  Asp;
     Xaa at\position 77 is Ile, Ser, Arg, Thr, or Leu;
     Xaa at position 78 is Leu, Ala, Ser, Olu, Phe, Gly, or Arg;
     Xaa at position 79 is Lys, Thr Asn Met, Art, Ile, Gly, or Asp;
     Xaa at position 80 is Asn, Trp, Val, Gly, Thr, Leu, Glu, or Arg;
     Xaa at position 81 is Leu, Gin, Gly, Ala, Trp, Arg, Val, or Lys;
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     Xaa at position 82 is Leu, Gln, Yys, Trp, Arg Asp, Glu, Asn, His,
                 Thr, Ser, Ala, Tyr, Phe, Ile, Met or Val;
     Xaa at position 83 is Pro, Ala, Thr, Trp, Arg, or Met;
     Xaa at position 84 is Cys, Glu, Gly, Arg, Met, or Val;
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     Xaa at position 85 is Leu, Asn, Val\ or Gln;
     Xaa at position 86 is Pro, Cys, Arg,\Ala, or Lys;
     Xaa at position 87 is Leu, Ser, Trp, \or Gly;
     Xaa at position 88 is Ala, Lys, Arg, 🕻al, or Trp;
     Xaa at position 89 is Thr, Asp, Cys, Leu, Val, Glu, His, Asn, or
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     Xaa at position 90 is Ala, Pro, Ser, Th, Gly, Asp, Ile, or Met;
     Xaa at position 91 is Ala, Pro, Ser, Thr, Phe, Leu, Asp, or His;
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Xaa at position 92 is Pro, Phe, Arg, Ser, Lys, His, Ala, Gly, Ite or Leu;

Xaa at position 93 is Thr, Asp, Ser, Asn, Pro, Ala, Leu, or Arg; Xaa at position 94 is Arg, Ile, Ser, Glu, Leu, Val, Gln,

5 Lys, His, Ala, or Pro;

Xaa at position 95 is His, Gln, Pro, Arg, Val, Leu, Gly,

Thr, Asn, Lys\ Ser, Ala, Trp, Phe, Ile, or Tyr;

Xaa at position 96 is Pro, Lys, Tyr, Gly, Ile, or Thr;

Xaa at position 97 is Ile, \data al, Lys, Ala, or Asn;

10 Xaa at position 98 is His, Ite, Asn, Leu, Asp, Ala, Thr,

Glu, Gln, Ser, Phe, Met, Val, Lys, Arg, Tyr or Pro;

Xaa at position 99 is Lie, Leu Arg, Asp, Val, Pro, Gln,

Gly, Ser/Phe, or His;

Xaa at position 100 is Lys, Tyr, Leu, His, Arg, Ile, Ser, Gln, or

Pro;

Xaa at position 101 is Asp, Pro, Met, Lys, His, Thr, Val,

Tyr, Glu, Asn, Ser, Ala, Gly, Ile, Lau, or Gln;

Xaa at position 102 is Gly, Leu, Glu, Lys, Ser, Trr, or Pro;

Xaa at position 103 is Asp, or Ser;

20 Xaa at position 104 is Trp, Val, Cys, Tyr, Thr, Met, Pro,

Leu, G\n, Lys, Ala, Phe, \or Gly;

Xaa at position 105\is Asn, Pro, Ala,\Phe, Ser,\Trp,\Gln,

Tyr, Leu, Lys, Ile, Asp, or His;

Xaa at position 106 is Glu, Ser, Ala, Mys, Thr, Ile, Gly, or Pro;

25 Xaa at position 108 is Arg, Lys, Asp, Leu, Thr, Ile, Gln,

His, Ser, Ala or Pro;

Xaa at position 109 is Arg, Thr, Pro, Glu, Tyr, Leu, Ser, or Gly;

Xaa at position 110 is Lys, Ala, Asn, Thr Leu, Arg, Gln,

His, Glu, Ser, or Trp;

30 Xaa at position 111 is Leu, Ile, Arg, Asp, or Met;

Xaa at position 112 is Thr, Val, Gln, Tyr, Glu, His, Ser, or Phe;

Xaa at position 113 is Phe, Ser, Cys, His, Gly, Trp, Tyr,

Asp, Lys, Leu, Ile, Val or Asn;

Xaa at position 114 is Tyr, Cys, His, Ser, Trp, Arg, or Leu;

35 Xaa at position 115 is Leu, Asn, Val, Pro, Arg, Ala, His,

Thr, Trp, or Met;

Xaa at position 116 is Lys, Leu, Pro, Thr, Met Asp, Val,

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Glu, Arg, Trp, Ser, Asn, His, Ala, Tyr, Phe, Gln, or Ile;

Xaa at position 117 is Thr, Ser, Asn, Ile, Trp, Lys, or Pro;
Xaa at position 118 is Leu, Ser, Pro, Ala, Glu, Cys, Asp, or Tyr;
Xaa at position 119 is Glu, Ser, Lys, Pro, Leu, Thr, Tyr, or Arg;
Xaa at position 120 is Asn, Ala, Pro, Leu, His, Val, or Gln;
Xaa at position 121 is Ala, Ser, Ile, Asn, Pro, Lys, Asp, or Gly;
Xaa at position 122 is Gln Ser, Met, Trp, Arg, Phe, Pro,
His, Ile, Tyr, or Cys;

10 Xaa at position 123 is Ala, Met, Glu, His, Ser, Pro, Tyr, or Leu;

wherein from 1 to 14 amino acids can be deleted from the N-terminus and/or from 1 to 15 amino acids can be deleted from the C-terminus of said human interleukin-3 mutant polypeptide; and wherein from 4 to 44 of the amino acids designated by Kaa are different from the corresponding amino acids of native (1-133) human interleukin-3;

R2 is a hematopoietic growth factor;

L is a linker capable of Linking R_1 to R_2 ; and said chimera protein can additionally be immediately preceded by (methionine $^{-1}$) (alanine $^{-1}$), or (methionine $^{-2}$, alanine $^{-1}$); and

- (b) harvesting said cultured stem cells.
- 2. A method for ex vivo expansion of stem cells, comprising the steps of;
 - (a) culturing said stem cells with a selected growth medium comprising a chimera protein having the formula selected from the group consisting of:

 R_1-L-R_2 , R_2-L-R_1 , R_1-R_2 , R_2 R_1 , R_1-L-R_1 and R_1-R_1

where n R_1 is a human interleukin-3 mutant polypeptide of SEQ ID NO:4

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5
       wherein
       Xaa at position 3 is Ser, Lys, Gly, Asp, Met, Gln, or Arg;
       Xaa at position 4 is Asn, His, Leu, Ile, Phe, Arg, or Gln;
       Xaa at position 5 is Melat, Phe, Ile, Arg, Gly, Ala, or Cys;
       Xaa at position 6 is Ile\ Cys, Gln, Glu, Arg, Pro, or Ala;
       Xaa at position 7 is Asp,\Phe, Lys, Arg, Ala, Gly, Glu,
 10
                    Gln, Asn, Thr,\Ser or Val;
       Xaa at position 8 is Glu, T_{\mathbf{t}}^{\mathbf{t}}p, Pro, Ser, Ala, His, Asp,
                   Asn, Gln, Leu, Val, or Gly;
       Xaa at position 9 is Ile, Val Ala, Gly, Trp, Lys,
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                   Phe, Ser, or Arg;
       Xaa at position 10 is Ile, Gly, Val, Arg, Ser, Phe, or Leu;
       Xaa at position 11 is Thr, His Gly, Gha, Arg, Pro, or Ala;
      Xaa at position 12 is His, Thr, the, Gly, Arg, Ala, or Trp;
      Xaa at position 13 is Leu, Gly, Arg, Thr, Ser, or Ala;
      Xaa at position 14 is Lys, Arg, Leu, Gln, Gly, Pro, Val or Trp;
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      Xaa at position 15 is Gan, Asn, Leu, Pro, Arg, or Val;
      Xaa at position 16 is Pro, His, Thr, Gly, Asp, Glh, Ser, Leu, or
                   Lys;
      Xaa at position 17 is Pro, Asp, Gly, Ala, Arg, Weu, or Gln;
      Xaa at position 18 is Leu, Val, Arg, Gln, Asn, Gly, Ala, or Glu;
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      Xaa at position 19 is Pro\langle Leu, Gln, \langle la, Thr, \phir\langle Glu;
      Xaa at position 20 is Leu, Val, Gly, Ser, Lys, Gly, Gln,
                  Thr, Arg, Ala, Phe, Ile or Met;
      Xaa at position 21 is Leu, Ala, Gly, Ash, Pro, Gln, or Val;
     Xaa at position 22 is Asp, Leu, or Val;
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     Xaa at position 23 is Phe, Ser, Pro, Trp or Ile;
      Xaa at position 24 is Asn, or Ala;
     Xaa at position 26 is Leu, Trp, or Arg;
     Xaa at position 27 is Asn, Cys, Arg, Leu, His, Met, Pro;
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     Xaa at position 28 is Gly, Asp, Ser, Cys, Ala, Lys, Asn,
                  Thr, Leu, Val, Glu, Phe, Tyr, I_{\mathbf{q}}^{\mathbf{l}}e or Met;
     Xaa at position 29 is Glu, Asn, Tyr, Leu, Phe, Asp, Ala,
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nj.

Leu;

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alg n$, Arg, Thr, Gly or Ser; Xaa at position 30 is Asp, Ser, Leu, Arg, Lys, Thr, Met, Trp, Glu, Asn, Gln, Ala or Pro; Xaa at position 31 As Gln, Pro, Phe, Val, Met, Leu, Thr, 5 Lys, Asp, Asn, Arg, Ser, Ala, Ile, Glu, His or Trp; Xaa at position 32 is Asp, Phe, Ser, Thr, Cys, Glu, Asn, Gln, Lys, H_i s, Ala, Tyr, Ile, Val or Gly; Xaa at position 33 is Ile, Gly, Val, Ser, Arg, Pro, or His; Xaa at position 34 is Leu\ Ser, Cys, Arg, Ile, His, Phe, 10 Glu, Lys, Thr,\Ala, Met, Val or Asn; Xaa at position 35 is Met, Arg, Ala, Gly, Pro, Asn, His, or Asp; Xaa at position 36 is Glu, Leu, Thr, Asp, Tyr, Lys, Asn, Ser, Ala, Ile, Val, His, Phe, Met or Gln; Xaa at position 37 is Asn, Arg Met, Pro, Ser, Thr, or His; Xaa at position 38 is Asn, Mis, Arg, Leu, Cly, Ser, or Thr; 15 Xaa at position 39 is Leu,/Thr, Ala, Gly, Glu, Pro, Lys, Ser, or Met; Xaa at position 40 is Ard, Asp, Ite, Ser, Val, Thr, Gln, Asn, Lys, His, Ala or Leu; 20 Xaa at position 41 is Arg, Thr, Val Ser, Leu, of Gly; Xaa at position 42 is $Pro\sqrt{Gly}$, $Cys\sqrt{Ser}$, Gln, $Gl\sqrt{h}$, His, Thr, Ala, Tyr, Phe, Leu, Val or Lys; Xaa at position 43 is Asn on Gly; Kaa at position 44 is Leu, Sek, Asp, Arg, Gln,/Val, or Cys; 25 Xaa at position 45 is Glu, Tyr, Wis, Leu, Pro, or Arg, Xaa at position 46 is Ala, Ser, Pro, Tyr, Asn, or Thr Xaa at position 47 is Phe, Asn, Glu, Pro Lys, Arg, or Ser; Xaa at position 48 is Asn, His, Val, Arg,\Pro, Thr, Asp,\or Ile; Xaa at position 49 is Arg, Tyr, Trp, Lys, Ser, His, Pro, or Val; Xaa at position 50 is Ala, Asn, Pro, Ser, or Lys; 30 Xaa at position 51 is Val, Thr, Pro, His, Leu, Phe, or Ser; Xaa at position 52 is Lys, Ile, Arg, Val, Ash, Glu, or Ser; Xaa at position 53 is Ser, Ala, Phe, Val, Gly, Asn, Ile, Pro, or His; 35 Xaa at position 54 is Leu, Val, Trp, Ser, Ile, Phe, Thr, or His; Xaa at position 55 is Gln, Ala, Pro, Thr, Glu, Arg, Trp, Gly, or

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Xaa at position 56 is Asn, Leu, Val, Trp, Pro, or Ala; Xaa at posttion 57 is Ala, Met, Leu, Pro, Arg, Glu, Thr, Gln, Trp, or Asn; Xaa at position 58 is Ser, Glu, Met, Ala, His, Asn, Arg, or Asp; Xaa at position 59 is Ala, Glu, Asp, Leu, Ser, Gly, Thr, or Arg; 5 Xaa at position 60 is Ile, Met, Thr, Pro, Arg, Gly, Ala; Xaa at position 61 is Glu, Lys, Gly, Asp, Pro, Trp, Arg, Ser, Gln, or, Leu Xaa at position 62 is Ser, Val, Ala, Asn, Trp, Glu, Pro, Gly, or 10 Asp; Xaa at position 63 is tle, Ser, Arg, Thr, or Leu; Xaa at position 64 is Leu, Ala, Ser, Glu, Phe, Gly, or Arg; Xaa at position 65 is Lys. Thr, Gly, Asn, Met, Arg, Ile, or Asp; Xaa at position 66 is Asn\ Trp, Val, Gly, Thr, Leu, Glu, or Arg; Xaa at position 67 is Leu, \Gln, Gly, Ala, Trp, Arg, Val, or Lys; 15 Xaa at position 68 is Leu, dln, Lys, Top, Arg, Asp, Glu, Asn, His, Thr, Ser, Ala, Tyl Phe, Ile, Met or Val; Xaa at position 69 is Pro, Ala, Thr, Trp Arg, or Met; Xaa at position 70 is Cys, Glu, Gly, Arg Met, or Val; Xaa at position 71 is Leu, Asn, Val, or dl_n ; Xaa at position 72 is Pro, Cys, Arg, Ala of Lys; Xaa at position $\$ 3 is Leu, Ser, Tr $\$ p, or $\$ ely; $\$ Xaa at position 74\is Ala, Lys, Arg\, Val/, or \tag; Xaa at position 75 is Thr, Asp, Cys, Leu, Val, Glu, His, Asn, or Ser: Xaa at position 76 is Ala, Pro, Ser, Thr, Gly, Asp, Ile, or Met; Xaa at position 77 is Ala, Pro, Ser, Thr, Phe, Leu Asp, or His; Xaa at position 78 is Pro, Phe, Arg, Ser, Lys, His, Ala, Gly, Ile or Leu; Xaa at position 79 is Thr, Asp, Ser, Asn, \Pro, Ala, Leu, or Arg; Xaa at position 80 is Arg, Ile, Ser, Glu, Neu, Val, Gln, Lys, His, Ala or Pro; Xaa at position 81 is His, Gln, Pro, Arg, Vat, Leu, Gly, Thr, Asn, Lys, Ser, Ala, Trp, Phe Ile or Tyr; Xaa at position 82 is Pro, Lys, Tyr, Gly, Ile,\ or Thr; Xaa at position 83 is Ile, Val, Lys, Ala, or Asn; Xaa at position 84 is His, Ile, Asn, Leu, Asp, Ala, Thr,

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Glu, Gln, Ser, Phe, Met, Val, Lys, Arg, Tyr or Pro;
Xaa at position 85\is Ile, Leu, Arg, Asp, Val, Pro, Gln,
            Gly, Ser, Phe, or His;
Xaa at position 86 \(\frac{1}{4}\)s Lys, Tyr, Leu, His, Arg, Ile, Ser, Gln, Pro;
Xaa at position 87 is Asp, Pro, Met, Lys, His, Thr, Val,
            Tyr, Glu,\Asn, Ser, Ala, Gly, Ile, Leu or Gln;
Xaa at position 88 is Gly, Leu, Glu, Lys, Ser, Tyr, or Pro;
Xaa at position 89 is Asp, or Ser;
Xaa at position 90 is Tro, Val, Cys, Tyr, Thr, Met, Pro,
            Leu, Gln, Lys\ Ala, Phe, or Gly;
Xaa at position 91 is Asn,\Pro, Ala, Phe, Ser, Trp, Gln,
            Tyr, Leu, Lys, Tle, Asp, or His;
Xaa at position 92 is Glu, Ser, Ala, Lys, Thr, Ile, Gly, or Pro;
Xaa at position 94 is Arg, Lys, Asp, Leu, Thr, Ile, Gln,
            His, Ser, Ala, or Pro;
Xaa at position 9∮ is Arg, Thr\ Pro, Glu\ Tyr, Leu, Ser, or Gly;
Xaa at position 96 is Lys, Asn, Thr, Leu Gln, Arg,
            His, Glu, Ser, Ala of Trp;
Xaa at position 97 is Leu, Ile, Arg, Asp, or Met;
Xaa at position 98\is Thr, Val, Glh, Tyr, Glu, His, Ser, or Phe;
Xaa at position 99 \( \)s Phe, Ser, Cys\( \), His, Gl\( \), Trp, Tyr,
            Asp, Lys \ Leu, Ile, Val \or Ash;
Xaa at position 100 is Tyr, Cys, His Set, Trp, Arg, or Leu;
Xaa at position 101 is Leu, Asn, Val, Pro, Arg, Ala, His,
            Thr, Trp, or Met;
Xaa at position 102 is Lys, Leu, Pro, thr, Met, Asp, Val,
            Glu, Arg, Trp, Ser, Asn, His, Ala, Tyk, Phe, Gln, or
            Ile;
Xaa at position 103 is Thr, Ser, Asn, Ile, Trp, Lys, or Pro;
Xaa at position 104 is Leu, Ser, Pro, Ala Glu, Cys, Asp, or Tyr;
Xaa at position 105 is Glu, Ser, Lys, Pro,\Leu, Thr, Tyr, or Arg;
Xaa at position 106 is Asn, Ala, Pro, Leu, His, Val, or Gln;
Xaa at position 107 is Ala, Ser, Ile, Asn, Pro, Lys, Asp, or Gly;
Xaa at position 108 is Gln, Ser, Met, Trp, Ang, Phe, Pro,
            His, Ile, Tyr, or Cys;
Xaa at position 109 is Ala, Met, Glu, His, Ser Pro, Tyr, or Leu;
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wherein from 4 to 44 of the amino acids designated by Xaa are different from the corresponding native amino acids of (1-133) human interleukin-3;

R2 is a hematopoietic growth factor;

L is a linker capable of Linking R_1 to R_2 ; and said chimera protein can additionally be immediately preceded by (methionine $^{-1}$), (alanine $^{-1}$), or (methionine $^{-2}$, alanine $^{-1}$); and

- (b) harvesting said cultured stem cells.
- 3/ A method for ex vivo expansion of stem 15 cells, comprising the steps of;
 - (a) culturing said stem cells with a selected growth medium comprising a chimera protein having the formula selected from the group consisting of:

 R_1-L-R_2 , R_2-L-R_1 , R_1-R_2 , R_2-R_1 , R_1-L-R_1 and R_1-R_1

wherein R₁ is a human interleukin-3 mutant polypeptide of SEQ ID NO.7

wherein m is 0 or 1; Xaa at position 18 is Asn or Ile; Xaa at position 19 is Met, Ala or Ile; Xaa at position 20 is Ile, Pro or Leu; Xaa at position 23 is Ile, Ala

- or Leu; Xaa at position 25 is Thr or His; Xaa at position 29 is Gln, Arg, Val or Leu; Xaa at position 32 is Leu, Ala, Asn or Arg; Xaa at position 34 is Leu or Ser; Xaa at position 37 is Phe, Pro, or Ser; Xaa at position 38 is Asn or Ala; Xaa at position 42 is Gly, Ala, Ser, Asp or Asn; Xaa at position 45 is Gln, Val,
- or Met; Xaa at position 46 is Asp or Ser; Xaa at position 49 is Met, Ile, Leu or Asp; Xaa at position 50 is Glu or Asp; Xaa at position 51 is Asn Arg or Ser;

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Xaa at position 55 is Arg, Leu, or Thr; Xaa at position 56 is Pro or Serk Xaa at position 59 is Glu or Leu; Xaa at position 60 is Ala or Ser; Xaa at position 62 is Asn, Val or Pro; Xaa at position 63 is Arg or His; Xaa at position 65 is \Val or Ser; Xaa at position 67 is 5 Ser, Asn, His or Gly; Xaa at position 69 is Gln or Glu; Xaa at position 73 is Ala or Gly; Xaa at position 76 is Ser, Ala or Aro; Xaa at position 79 is Lys, Arg or Ser; Xaa at position 82 is Leu, Glu, Val or Trp; Xaa at position 85 is Leu or Val; Xaa at position 87 is 10 Leu, Ser, Trp; Xaa at position 88 is Ala or Trp; Xaa at position 91 is Ala or Pro; Xaa at position 93 is Pro or Ser; Xaa at position ₹5 is His or Thr; Xaa at position 98 is His, Ile or Thr. Xaa at position 100 is Lys or Arg; Xaa at position 101 is Asp, Ala or Met; Xaa at 15 position 105 is Asn or \Gln; Xaa at position 109 is Arg, Glu or Leu/ Xaa at position 112\is Thr or Gln; Xaa at position 116 is Lys, Val, Trp or Ser; Xaa at position 117 is Thror Ser; Xaa at position 120 is Asn, Gln, or His; Xaa at position 123 \is Ala on Glu; with the 20 proviso that from four to forty-four of the amino acids designated by Xaa are different from the corresponding

R2 is a hematopoietic growth factor;

amino acids of native human interleukin-3);

L is a linker capable of Linking R_1 to R_2 ; and said chimera protein can additionally be immediately preceded by (methionine 1), (alanine 1), or (methionine 2, alanine 1); and

- (b) harvesting said cultured stem cells.
- 4. A method for ex vivo expansion of stem 35 cells, comprising the steps of;
 - (a) culturing said stem cells with a selected

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growth medium\comprising a chimera protein having the formula selected from the group consisting of:

 R_1-L-R_2 , $R_2-L \nmid R_1$, R_1-R_2 , R_2-R_1 , R_1-L-R_1 and R_1-R_1

wherein \R_1 is a human interleukin-3 mutant polypeptide of SEQ\ID NO:8

wherein m is 0 or $1 \nmid n$ is 0 or 1; p is 0 or 1; Xaa at position 4 is Asn or \(\text{Ile} ; \text{Xaa at position 5 is Met, Ala} \) or Ile: Xaa at position 6 is Ile, Pro or Leu; Xaa at position 9 is Ile, Ala or Leu; Xaa at position 11 is Thr or His; Xaa at position 15 is Gln, Arg, Val or Leu; Xaa at position 18 is Neu, Ala, Asn or Arg; Xaa at position 20 is/Leu or Ser; Xaa at position 23 is Phe, Pro, or Ser; * aa at position 24 is Asn or Ala; Xaa at position 28 is Gly, Ala, Ser, Asp of Asn; Xaa at position 31 is Gln, Val, or Met; Xaa at position 32 is Asp or Ser; Xaa at position 35 is Met, Ile, Leu or Asp; Xaa at position 36 is Glu or Asp; Xaa at position 37 is Asn, Arg or Ser; Xaa at position 41 is Arg, Leu, or Thr; Xaa at position 42 is Aro or Set; Xaa at position 45 is Glu or Let; Xaa at posttion 46 is Ala or Ser; Xaa at position 48 is Asn, Val or Pro; Kaa at position 49 is Arg or His; Xaa at position 51/is Val or Ser; Xaa at position 53 is Ser, Asn, His or Gly; Xaa at position 55 is Gln or Glu; Xaa at position \$9 is Ala or\Gly; Xaa at position 62 is Ser, Ala or Pro; Kaa at position 65 is Lys, Arg or Ser; Xaa at position \67 is Leu, Glu, or Val; Xaa at position 68 is Leu, &lu, Val or Trp; Xaa at position 71 is Leu or Val; Xaa at position 73 is Leu, Ser or Trp; Xaa at position 74 is Ala or Trp; Xaa

30 at position 77 is Ala or Pro; Xaa at position 79 is Pro or Ser; Xaa at position 81 is His or Thr; Xaa at

35 position 84 is His, Ile, or Thr; Xaa \at position 86 is Lys or Arg; Xaa at position 87 is $Asp\$ Ala or Met; Xaa at position 91 is Asn or Glu; Xaa at position 95 is

Arg, Glu, Leu; Xaa at position 98 Thr or Gln; Xaa at position 102 is Lys, Val, Trp or Ser; Xaa at position 103 is Thr or Ser; Xaa at position 106 is Asn, Gln, or His; Xaa at position 109 is Ala or Glu; with the proviso that from four to forty-four of the amino acids designated by Xaa are different from the corresponding amino acids of native (15-125) human interleukin-3;

R2 is a hematopoietic growth factor;

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L is a linker capable of Linking R_1 to R_2 ; and said chimera protein can additionally be immediately preceded by (methionine $^{-1}$), (alanine $^{-1}$), or (methionine $^{-2}$, alanine $^{-1}$); and

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- (b) harmesting said cultured stem cells.
- 5. The method according to claim 2 wherein R1 is selected from the group consisting of:

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Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn Ala Glu Asp Val Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln Gln SEQ ID NO:9;

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Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asp Pro Ash Ash Ser Glu Asp Met Asp Ile Leu Met Glu Ash Ash Leu Arg Arg Pro Ash Leu Glu Ala Phe Ash Arg Ala Val Lys Ser Leu Gln Ash Ala Ser Ala Ile Glu Ser Ile Leu Lys Ash Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Ash Glu Phe Arg Arg Lys Leu Thr

Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln Gln SEQ ID NO:10;

Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys

Val Pro Pro Ala Pro Leu Leu Asp Ser Asn Asn Leu Asn Ser
Glu Asp Met Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro
Asn Leu Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn
Ala Ser Ala Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys
Leu Pro Leu Ala Thr Ala Ala Pro Thr Arg His Pro Ile His

10 Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg Arg Lys Leu Thr
Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln Gln SEQ
ID NO:11;

Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly
Glu Asp Gln Asp Vle Leu Met Glu Arg Asn Leu Arg Leu Pro
Asn Leu Leu Ala Phe Val Arg Ala Val Lys Asn Leu Glu Asn
Ala Ser Ala Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys
Leu Pro Leu Ala Thr Ala Ala Pro Thr Arg His Pro Ile His

10 Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg Arg Lys Leu Thr
Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln Gln SEQ
ID NO:12;

Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly
Glu Asp Gln Asp Ile Leu Met Glu Arg Asn Leu Arg Leu Pro
Asn Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn
Ala Ser Ala Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys
Leu Pro Leu Ala Thr Ala Ala Pro Thr Arg His Pro Ile His

Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg Arg Lys Leu Thr
Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln Gln SEQ
ID NO:13;

Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys

Glu Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly
Glu Asp Gln Asp Ile Leu Met Glu Arg Asn Leu Arg Thr Pro
Asn Leu Leu Ala Phe Val Arg Ala Val Lys His Leu Glu Asn

Ala Ser Ala Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln Gln SEQ ID NO:14;

Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ara Pro Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln Gln SEQ ID NO:15;

Asn Cys Ser Asn Met tle Asp Glu Ile Ile Thr His Leu Lys Gln Pro Pro Leu Pro Ileu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln Gln SEQ ID NO:16;

Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln Gln SEQ ID NO:17;

Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys

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Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Ser Leu Glu His Ala Gln Glu Gln Gln SEQ ID NO:18;

- Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys Gln Pro Pro Leu Pro Deu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln Gln SEQ ID NO:19;
- Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln Gln SEQ ID NO:20;
- Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Ser Leu Glu His Ala Gln Glu Gln Gln SEQ

ID NO:21;

Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn Ala Glu Asp Val Asp Ile Leu Met Glu Arg Asn Leu Arg Leu Pro Asn Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Ala Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys Tar Leu Glu Asn Ala Gln Ala Gln Gln SEQ ID NO:22;

Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn Ser Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr Pro Asn Leu Leu Ala Phe Val Arg Ala Val Lys His Leu Glu Asn Ala Ser Ala Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln Gln SEQ ID NO:23;

Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
Val Pro Pro Ala Pro Leu Leu Asp Ser Asn Asn Leu Asn Ser
Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Leu Pro
Asn Leu Leu Ala Phe Val Arg Ala Val Lys Asn Leu Glu Asn
Ala Ser Ala Ile Glu Ser Ile Leu Lys Asn Leu Pro Cys
Leu Pro Leu Ala Thr Ala Ala Pro Thr Arg His Pro Ile His
Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg Arg Lys Leu Thr
Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln Gln SEQ
ID NO:24;

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His
Leu Lys Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu
Asn Gly Glu Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg
Arg Pro Asn Leu Glu Ala Phe Asn Arg Ala Val Lys Ser Leu
Gln Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln

Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln Gln SEQ ID NO:25;

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Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln Gln SEQ ID NO: 26;

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Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys Ala Gly Asp Tro Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Ser Leu Glu His Ala Gln Glu Gln Gln SEQ ID NO:27;

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Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn Ala Glu Asp Val Asp Ile Leu Met Glu Arg Asn Leu Arg Leu Pro Asn Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Ala Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln Gln SEQ ID NO:28;

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Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn Ser Gin Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg
Thr Pro Asn Leu Leu Ala Phe Val Arg Ala Val Lys His Leu
Glu Asn Ala Ser Ala Ile Glu Ser Ile Leu Lys Asn Leu Leu
Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro Thr Arg His Pro
Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg Arg Lys
Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
Gln SEQ ID NO:29;

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His

Leu Lys Val Pro Pro Ala Pro Leu Leu Asp Ser Asn Asn Leu
Asn Ser Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg
Leu Pro Asn Leu Leu Ala Phe Val Arg Ala Val Lys Asn Leu
Glu Asn Ala Ser Ala Ile Glu Set Ile Leu Lys Asn Leu Leu
Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro Thr Arg His Pro

Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg Arg Lys
Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
Gln SEQ ID NO:30;

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His
Leu Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu
Asn Ala Glu Asp Val Asp Ile Leu Met Glu Arg Asn Leu Arg
Leu Pro Asn Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu
Glu Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln
Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro
Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys
Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
Gln SEQ ID NO:31;

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His

Leu Lys Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu
Asn Ser Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg
Thr Pro Asn Leu Leu Ala Phe Val Arg Ala Val Lys His Leu
Glu Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln
Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro

Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys
Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
Gln SEQ ID NO:32;

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys Val Pro Pro Ala Pro Leu Leu Asp Ser Asn Asn Leu Asn Ser Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Leu Pro Asn Leu Leu Ala Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln Gln Gln SEQ ID NO:33;

Met Ala Asn Cys Ser Ile Met Ale Asp Glu Ile Ile His His
Leu Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu
Asn Ala Glu Asp Val Asp Ile Leu Met Glu Arg Asn Leu Arg
Leu Pro Asn Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu
Glu Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Val
Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro
Ile Thr Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys
Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
Gln SEQ ID NO:34;

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys Val Pro Pro Ala Pro Leu Leu Asp Ser Asn Asn Leu Asn Ser Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Leu Pro Asn Leu Leu Ala Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln 30 Gln SEQ ID NO:35;

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His
Leu Lys Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu
Asn Ser Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg
Thr Pro Asn Leu Leu Ala Phe Val Arg Ala Val Lys His Leu
Glu Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Val
Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro

Ile Thr Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Ser Leu Glu His Ala Gln Glu Gln Gln SEQ ID NO:36;

- Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His
 Leu Lys Val Pro Pro Ala Pro Leu Leu Asp Ser Asn Asn Leu
 Asn Ser Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg
 Leu Pro Asn Leu Leu Ala Phe Val Arg Ala Val Lys Asn Leu
 Glu Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Val
 Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro
 Ile Thr Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys
 Leu Thr Phe Tyr Leu Val Ser Leu Glu His Ala Gln Glu Gln
 Gln SEO ID NO:37;
- Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His
 Leu Lys Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu
 Asn Ser Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg
 Thr Pro Asn Leu Leu Ala Phe Val Arg Ala Val Lys His Leu
 Glu Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Val
 Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro
 Ile Thr Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys
 Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
 Gln SEQ ID NO:38;
- Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His
 Leu Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu
 Asn Ala Glu Asp Val Asp Ile Leu Met Glu Arg Asn Leu Arg
 Leu Pro Asn Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu
 Glu Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Val
 30 Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro
 Ile Thr Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys
 Leu Thr Phe Tyr Leu Val Ser Leu Glu His Ala Gln Glu Gln
 Gln SEQ ID NO:39;
- Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn Ala Glu Asp Val Asp Ile Leu Met Asp Arg Asn Leu Arg

Leu Ser Asn Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Cly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln Gln SEQ ID NO:40;

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ala Ile His His
Leu Lys Arg Pro Pro Ala Pro Ser Leu Asp Pro Asn Asn Leu

10 Asn Asp Glu Asp Met Ser Ile Leu Met Glu Arg Asn Leu Arg
Leu Pro Asn Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu
Glu Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln
Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro
Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys

15 Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
Gln SEQ ID NO:41;

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His
Leu Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu
Asn Asp Glu Asp Met Ser Ile Leu Met Glu Arg Asn Leu Arg
Leu Pro Asn Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu
Glu Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln
Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro
Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys
Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln

Gln SEQ ID NO:42;

Gln SEQ ID NO:43;

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His
Leu Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu
30 Asn Ala Glu Asp Val Asp Ile Leu Met Asp Arg Asn Leu Arg
Leu Pro Asn Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu
Glu Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln
Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro
Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys
35 Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln

Met Ala Asn Cys Fer Ile Met Ile Asp Glu Ile Ile His His Leu Lys Arg Pro Aro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn Asp Glu Asp Val Ser Ile Leu Met Glu Arg Asn Leu Arg Leu Pro Asn Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Gly\Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Vall Thr Leu Glu Gln Ala Gln Glu Gln Gln SEQ ID NO:44;

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Met Ala Asn Cys/Ser Ile Wet \le Asp Glu Ile Ile His His Leu Lys Arg Pr ϕ Pro Ala Pro Leu Asp Pro Asn Asn Leu Asn Asp Glu Asp Met Ser Ile Leu Met Glu Arg Asn Leu Arg Leu Pro Asn Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Gly Ile Glu Ala Ite Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala That Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln Gln SEQ ID NO:45

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Met Ala Tyr Pro Glu Thr Asp Tyr Lys Asp Asp Asp Asp Lys Asn Cys Ser Ile Met\le Asp Gl\u03c4 I/e Ile\His His Leu Lys Arg Pro Pro Ala Pro Deu Leu Asp Pro Asn Asn Leu Asn Ala Glu Asp Val Asp Ile Leu Met Glu Arg Asn Leu Arg Leu Pro 25 Asn Leu Glu Ser Phe Val Arg Ala Val Lys Aşn Leu Glu Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln SEQ

30 ID NO:46;

Met Ala Tyr Pro Glu Thr Asp Tyr Lys Asp Asp Asp Lys Asn Cys Ser Ile Met Ile Asp Glu Ile Ite His His Leu Lys Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn Ser 35 Glu Asp Met Asp Ile Leu Met Glu Arg Ash Leu Arg Thr Pro Asn Leu Leu Ala Phe Val Arg Ala Val Lys His Leu Glu Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn\Leu Gln Pro Cys

Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln Gln SEQ ID NO:47; and

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Met Ala Asn Cys Ser Ile Met Ile Asp Glu Leu Ile His His Leu Lys Ile Pro Pro Asn Pro Ser Leu Asp Ser Ala Asn Leu Asn Ser Glu Asp Val Ser Ile Leu Met Glu Arg Asn Leu Arg Thr Pro Asn Leu Leu Ala Phe Val Arg Ala Val Lys His Leu Glu Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln Gln SEQ ID NO:48.

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- wherein is R₂ is R₁ or a hematopoietic growth factor selected from the group consisting of: GM-CSF, CSF-1, G-CSF, G-CSF Ser¹, c-mpl ligand (MGDF or TPO), M-CSF, erythropoietin (EPO), IL-1, IL-2, IL-3, IL-4, IL-5, IL-6, IL-7, IL-8, IL-9, IL-10, IL-11, IL-12, ID-13, IL-15, IL-16, LIF, flt3 ligand, human growth hormone, B-cell growth factor, B-cell differentiation factor, eosinophil differentiation factor and stem cell factor (SCF);
 - 7. The method of claim 6 wherein is R_2 is selected from the group consisting of G-CSF, G-CSF Ser¹⁷, flt3 ligand and c-mpl ligand.

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8. The method of claim 2 wherein said chimera protein is selected from group consisting of: SEQ ID NO:121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 165, 166, 167 and 168.

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- 9. The method of claim 9 wherein said chimera protein is selected from group consisting of: SEQ ID NO:124, SEQ ID NO:133, SEQ ID NO:154 and SEQ ID NO:155.
- wherein said culture medium further comprises a hematopoietic growth factor selected from the group consisting of: GM-CSF, CSF-1, G-CSF, G-CSF Ser¹⁷, c-mpl ligand (MGDF or TPO), M-CSF, erythropoietin (EPO), IL-1, IL-4, IL-2, IL-5, IL-6, IL-7, IL-8, IL-9, IL-10, IL-11, IL-12, IL-13, IL-15, IL-16, LIF, flt3 ligand, human growth hormone, B-cell growth factor, B-cell differentiation factor, eosinophil differentiation factor and stem cell factor (SCF).
- 11. The method of claim 6 wherein said culture medium further comprises a hematopoietic growth 20 factor selected from the group consisting of: GM-CSF, CSF-1, G-CSF, G-CSF Ser¹⁷, c-mpl linand (MGDF or TPO), M-CSF, erythropoietin (EPO), IL-1, IL-4, IL-2, IL-5, IL-6, IL-7, IL-8, IL-9, IL-10, IL-11, IL-12, IL-13, IL-15, IL-16, LIF, flt3 ligand, human growth hormone, B-cell growth factor, B cell differentiation factor, eosinophil differentiation factor and stem cell factor (SCF).
- 12. The method of claim 7 wherein said
 30 culture medium further comprises a hematopoietic growth
 factor selected from the group consisting of: GM-CSF,
 CSF-1, G-CSF, G-CSF Ser¹⁷, c-mpl ligand (MGDF or TPO),
 M-CSF, erythropoietin (EPO), IL-1, IL-4, IL-2, IL-5,
 IL-6, IL-7, IL-8, IL-9, IL-10, IL-11, IL-12, IL-13, IL35 15, IL-16, LIF, flt3 ligand, human growth hormone, Bcell growth factor, B-cell differentiation factor,
 eosinophil differentiation factor and stem cell factor

(SCF).

\ 13. Cultured stem cells obtained by the method of claim 2.

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14. Cultured stem cells obtained by the method of claim 8.

- 15. Cultured stem cells obtained by the 10 method of claim 10.
- 16. The method of claim 1 wherein said mutant human interleukin-3 polypeptide has at least three times greater activity than native human interleukin-3, in at least one assay selected from the group consisting of: AML cell proliferation, TF-1 cell proliferation and Methylcellulose assay.
- 17. The method of claim 7 wherein said mutant human interleukin-3 polypeptide has at least three times greater activity than native human interleukin-3, in at least one assay selected from the group consisting of: AML cell proliferation, TF-1 cell proliferation and Methylcellulose assay.

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- 18. The method of claim 1 further comprising the step of separating the stem cells from a mixed population of cells prior to culturing the stem cells.
- 19. The method of claim 18 wherein said stem cells are separated from a mixed population of cells based on the stem cells having CD34 surface antigen.
- 20. A method for treatment of a patient 35 having a hematopoietic disorder, comprising the steps of;

(a) removing stem cells from said patient or a donor;

(b) culturing said stem cells with a selected growth medium comprising a chimera protein having the formula selected from the group consisting of:

 R_1-L-R_2 , R_2-L-R_1 , R_1-R_2 , R_2-R_1 , R_1-L-R_1 and R_1-R_1

wherein k_1 is a human interleukin-3 mutant 10 polypeptide of SEQ TD NO:1

wherein

Xaa at position 17 is Ser Lys, Gly, Asp, Met, Gln, or Arg;

Xaa at position 18 is Asn, His, Leu, Ile, Phe, Arg, or Gln;

15 Xaa at position 19/is Met, Phe, Ile Arg, Gly, Ala, or Cys;

Xaa at position 20 is Ile, Cys, Gln, Glu, Arg, Pro, or Ala;

Xaa at position 21 is Asp, Phe, Lys, Arg, Ala, Gly, Glu,

Gln, Asn, Thr, Ser or Val;

Xaa at position 20 is Glu, Trp Pro, Ser Ala, His, Asp,

20 Asn, An, Leu, Val or Gly;

Xaa at position 23 is Ile, Val, Ala, Leu, Gly, Trp, Lys,

Phe, Ser or Arg;

Xaa at position 24 is \[\text{le, Gly, Val, Arg, Ser, Phe, or Leu;} \]

Xaa at position 25 is Thx, His, Gly, Gln, Arg, Pro, or Ala;

25 Xaa at position 26 is His, Thr, Phe, Gly, Arg, Ala, or Trp;

Xaa at position 27 is Leu, Gly, Arg, Thr, Ser, or Ala;

Xaa at position 28 is Lys, Arg, Leu, Gln, Gly, Pro, Val or Trp;

Xaa at position 29 is Gln, Asn, Leu, Pro, Arg, or Val;

Xaa at position 30 is Pro, His, Thr, ⟨ly, Asp, Gln Ser, Leu, or

30 Lys;

Xaa at position 31 is Pro, Asp, Gly, Ala, Arg, Leu, & Gln;

Xaa at position 32 is Leu, Val, Arg, Glm, Asn, Gly, Ala, or Glu;

Xaa at position 33 is Pro, Leu, Gln, Ala, Thr, or Glu;

Xaa at position 34 is Leu, Val, Gly, Ser Lys, Glu, Gln,

35 Thr, Arg, Ala, Phe, Ile or Met;

Xaa at position 35 is Leu, Ala, Gly, Asn, Pro, Gln, or Val;

Xaa at position 36 is Asp, Leu, or Val;

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Xaa at position 37 is Phe, Ser, Pro, Trp, or Ile;
     Xaa at position 38 is Asn, or Ala;
     Xaa at position 40 is Leu, Trp, or Arg;
     Xaa at position 41 is Asn, Cys, Arg, Leu, His, Met, or Pro;
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     Xaa at position 42 is Gly, Asp, Ser, Cys, Asn, Lys, Thr,
                 Leu, Val, Glu, Phe, Tyr, Ile, Met or Ala;
     Xaa at position 43 is Glu, Asn, Tyr, Leu, Phe, Asp, Ala,
                 Cys, dln, Arg, Thr, Gly or Ser;
     Xaa at position 44 \is Asp, Ser, Leu, Arg, Lys, Thr, Met,
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                 Trp, Glu, Asn, Gln, Ala or Pro;
     Xaa at position 45 is Gln, Pro, Phe, Val, Met, Leu, Thr,
                 Lys, Trp, Asp, Asn, Arg, Ser, Ala, Ile, Glu or His;
     Xaa at position 46 is Asp, Phe, Ser, Thr, Cys, Glu, Asn,
                 $ln, Lys, His, Ala, Txr, Ile, Val or Gly;
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     Xaa at position 47 is Ile Gly, Val Ser, Arg, Pro, or His;
     Xaa at position 48 is Leu, Ser, Cys, Arg, Ile, His, Phe,
                 Glu, Lys, Thr, Ala, Met, Val or Asn;
     Xaa at position 49 is Met, Arg, Ala, Gly, Pro, Asn, His, or Asp;
     Xaa at position 50 is Glu, Leu, Thr, Asp, Tyr, Lys, Asn,
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                 Ser,\Ala, Ile, Val, His, Phe, Met or Gln;
     Xaa at position 51 is Asn, Arg, Met, Pro, Ser, Thr, or His;
     Xaa at position 52 \is Asn, His, \Ar\g, Leu, Gl\y, Ser, or Thr;
     Xaa at position 53 is Leu, Thr, Ma, Gly, Glu, Pro, Lys,
                 Ser, or Met;
     Xaa at position 54 is Arg, Asp, Ile, Ser, Val, Thr, Gln,
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                 Asn, Lys, His, Ala or Deu;
     Xaa at position 55 is Arg, Thr, Val, Ser, Leu, or Gly;
     Xaa at position 56 is Pro, Gly, Cys, \Ser, Gln, Glu, Arg,
                 His, Thr, Ala, Tyr, Phe, Leu, Val or Lys;
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     Xaa at position 57 is Asn or Gly;
     Xaa at position 58 is Leu, Ser, Asp, Arg, Gln, Val, or Cys;
     Xaa at position 59 is Glu, Tyr, His, Leu, Pro, or Arg;
     Xaa at position 60 is Ala, Ser, Pro, Tyr Asn, or Thr;
     Xaa at position 61 is Phe, Asn, Glu, Pro, Lys, Arg, or Ser;
     Xaa at position 62 is Asn, His, Val, Arg, Pro, Thr, Asp, or Ile;
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     Xaa at position 63 is Arg, Tyr, Trp, Lys, Ser, His, Pro, or Val;
     Xaa at position 64 is Ala, Asn, Pro, Ser, or Lys;
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Xaa at position 65 is Val, Thr, Pro, His, Leu, Phe, or Ser;
Xaa at position\66 is Lys, Ile, Arg, Val, Asn, Glu, or Ser;
Xaa at position 67 is Ser, Ala, Phe, Val, Gly, Asn, Ile, Pro, or
            His;
Xaa at position 68 \square s Leu, Val, Trp, Ser, Ile, Phe, Thr, or His;
Xaa at position 69 ig Gln, Ala, Pro, Thr, Glu, Arg, Trp, Gly, or
            Leu;
Xaa at position 70 is Asn, Leu, Val, Trp, Pro, or Ala;
Xaa at position 71 is Ala, Met, Leu, Pro, Arg, Glu, Thr,
            Gln, Trp, or \Asn;
Xaa at position 72 is Ser Glu, Met, Ala, His, Asn, Arg, or Asp;
Xaa at position 73 /s Ala, Glu, Asp, Leu, Ser, Gly, Thr, or Arg;
Xaa at position 7 is Ile, Met, Thr, Pro, Arg, Gly, Ala;
Xaa at position ∄5 is Glu, L\u00edys, Gly, Asp\u00ed Pro, Trp, Arg,
            Ser/ Gln, or Leu;
Xaa at position 76 is Ser, Val, Ala, Asn, Trp, Glu, Pro, Gly, or
            Asp
Xaa at position 77 is Ile, Ser, Arg, Thr, or Leu;
Xaa at position 78 is Leu, Ala, Ser, Glu, the, Gly, or Arg;
Xaa at position 79 is Lys, Thr, Asn, Met, Arg, Ile, Gly, or Asp;
Xaa at position 80 is Asn, Trp, Val, Gly, Thi, Leu, Glu, or Arg;
Xaa at position 81 is Leu, Gln, Gly, Ala, Trp/ Arg, Val, or Lys;
Xaa at position 82 is Leu, Gln, Lys, Trp, Arg, Asp, Glu, Asn, His,
             Thr, Sex, Ala, Tyr, Phe lle, Met or Val;
Xaa at position 83 is Pro, Ala, Thr, Trp, Arg, or Met;
Xaa at position 84 is Cys, Glu, Gly, Arg, Met, or Val;
Xaa at position 85 is Leu, Asn. Val or Gln;
Xaa at position 86 is Pro, Cys, Arg, Ala, or Lys;
 Xaa at position 87 is Leu, Ser, Trp, or Gly;
 Xaa at position 88 is Ala, Lys, Arg, Val, or Trp;
 Xaa at position 89 is Thr, Asp, Cys, Leu, Val, Glu, His, Asn, or
             Ser:
 Xaa at position 90 is Ala, Pro, Ser, Thr, Gly, Asp, Ile, or Met;
 Xaa at position 91 is Ala, Pro, Ser, Thr,\ Phe, Leu, Asp, or His;
 Xaa at position 92 is Pro, Phe, Arg, Ser, Lys, His, Ala,
             Gly, Ile or Leu;
 Xaa at position 93 is Thr, Asp, Ser, Asn, Aro, Ala, Leu, or Arg;
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Xaa at position 94 As Arg, Ile, Ser, Glu, Leu, Val, Gln, Lys, His Ala, or Pro; Xaa at position 95 is His, Gln, Pro, Arg, Val, Leu, Gly, Thr, Asn,\Lys, Ser, Ala, Trp, Phe, Ile, or Tyr; 5 Xaa at position 96 is Pro, Lys, Tyr, Gly, Ile, or Thr; Xaa at position 97 is tle, Val, Lys, Ala, or Asn; Xaa at position 98 is His, Ile, Asn, Leu, Asp, Ala, Thr, Glu, Gln, Ser, Phe, Met, Val, Lys, Arg, Tyr or Pro; Xaa at position 99 is Ile, Leu, Arg, Asp, Val, Pro, Gln, 10 Gly, Ser, Phe or His; Xaa at position 100 is Lys√ Tyr, Leu, His, Arg, Ile, Ser, Gln, or Pro; Xaa at position 101/is Asp, Pro, Met, Lys, His, Thr, Val, Tyr, Ślu, Asn, Ser, Ala, Gly, Ile, Leu, or Gln; 15 Xaa at position 102 is Gly, Leu, Glu, Lys, Ser, Tyr, or Pro; Xaa at position 103 is Asp, or Ser; Xaa at position 104 is Trp, Val, Cys, Tyr, Thr, Met, Pro, Leu, Gln, Lys, Ala, Phe, or Gly; Xaa at position 105 is Asn, Pro, Ala, Phe, Ser, Trp, Gln, 20 Tyr, Leu, Lys, Ile, Asp, or His; Xaa at position 106 is Glu, Ser, Ala, Lys, Thr\ Ile, Gly, or Pro; Xaa at position 108 is Arg, Lys, Asp, Leu/ Thr, Ile, Gln, His, Ser Ala or Pro; Xaa at position 109 is Arg, Thr, Pro, Glu, Tyr, Leu, Ser, or Gly; Xaa at position 110 is Lys, Ala, Asm, Thr, Leu, Arg, Gln, 25 His, Glu, Ser, or Trp; Xaa at position 111 is Leu, Ile, Arg, Asp, or Met; Xaa at position 112 is Thr, Val, Gln, Tyr, Glu, His, Ser, or Phe; Xaa at position 113 is Phe, Ser, Cys, His, Gly, Trp, Tyr, Asp, Lys, Leu, Ile, Val or Asn; 30 Xaa at position 114 is Tyr, Cys, His, Set, Trp, Arg, or Leu; Xaa at position 115 is Leu, Asn, Val, Prd, Arg, Ala, His, Thr, Trp, or Met; Xaa at position 116 is Lys, Leu, Pro, Thr, Met, Asp, Val, 35 Glu, Arg, Trp, Ser, Asn, His, Ala, Tyr, Phe, Gln, or Ile;

Xaa at position 117 is Thr, Ser, Asn, Ile, Trp, Lys, or Pro;

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Xaa at position 118 is Leu, Ser, Pro, Ala, Glu, Cys, Asp, or Tyr;
Xaa at position 119 is Glu, Ser, Lys, Pro, Leu, Thr, Tyr, or Arg;
Xaa at position 120 is Asn, Ala, Pro, Leu, His, Val, or Gln;
Xaa at position 121 is Ala, Ser, Ile, Asn, Pro, Lys, Asp, or Gly;
Xaa at position 122 is Gln, Ser, Met, Trp, Arg, Phe, Pro,

His, Ile, Tyr, or Cys;

Xaa at position 123 is Ala, Met, Glu, His, Ser, Pro, Tyr, or Leu;

wherein from 1 to 14 amino acids can be deleted from

the N-terminus and/or from 1 to 15 amino acids can be
deleted from the C-terminus of said human interleukin-3
mutant polypeptide; and wherein from 4 to 44 of the
amino acids designated by Xaa are different from the
corresponding amino acids of native (1-133) human
interleukin-3;

R2 is a hematopdietic growth factor;

- L is a linker capable of Linking R₁ to R₂;

 20 and said chimera protein can addittionally be preceded by (methionine), (alanine), or (methionine , alanine); and
 - (c) harvesting said cultured stem cells; and (d) transplanting said cultured stem cells into said patient.
- 21. A method for treatment of a patient having a hematopoietic disorder, comprising the steps of;
 - (a) removing stem cells from said patient or a donor;
- (b) culturing said stem cells with a selected growth medium comprising a chimera protein having the formula selected from the group consisting of:

 R_1-L-R_2 , R_2-L-R_1 , R_1-R_2 , R_2-R_1 , R_1-L-R_1 and R_1-R_1

wherein R_1 is a human interleukin-3 mutant polypeptide of SEQ ID NO:4

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wherein

Xaa at position 3 is\Ser, Lys, Gly, Asp, Met, Gln, or Arg;

Xaa at position 4 is Asn, His, Leu, Ile, Phe, Arg, or Gln;

Xaa at position 5 is Met, Phe, Ile, Arg, Gly, Ala, or Cys;

10 Xaa at position 6 is Ile, Cys, Gln, Glu, Arg, Pro, or Ala;

Xaa at position 7 is Asp\ Phe, Lys, Arg, Ala, Gly, Glu,

Gln, Asn, Thr, Ser or Val;

Xaa at position 8 is Elu, Trp, Pro, Ser, Ala, His, Asp,

Asn, 191n, Leu, Val, or Gly;

15 Xaa at position p is Ile, Val, Ala, Leu, Gly, Trp, Lys,

Phe Ser, or Arg;

Xaa at position 10 is Ile, Gly, Val, Arg Ser, Phe, or Leu;

Xaa at position 11 is Thr, His, Gly, Glh Arg, Pro, or Ala;

Xaa at position 12 is His, Thr Phe, Gly, Arg, Ala, or Trp;

20 Xaa at position 13 is Leu, Gly, Arg, Thr, Ser, or Ala;

Xaa at position 14 is Lys, Arg, Leu, Gln Gl1, Pro, Val or Trp;

Xaa at position 15 is Gln, Asn, Leu, Pro Arg or Val;

Xaa at position 16 is Pro, His, Thr, Gly, Asp, Gln, Ser, Leu, or

Lys;

25 Xaa at position 17 is Pro, Asp, Gly, Ala, Arg, Leu, or Gln;

Xaa at position 18 is Leu, Val, Arg Gln, Asn, Gly, Ala, or Glu;

Xaa at position 19 is Pro, Leu, Gln, Ala, Thr, or Glu;

Xaa at position 20 is Leu, Val, Gly, \Ser, Lys, Glu, Gln,

Thr, Arg, Ala, Phe, Ile of Met;

30 Xaa at position 21 is Leu, Ala, Gly, Asn, Pro, Gln, or Val;

Xaa at position 22 is Asp, Leu, or Val;

Xaa at position 23 is Phe, Ser, Pro, Trp, or Ile;

Xaa at position 24 is Asn, or Ala;

Xaa at position 26 is Leu, Trp, or Arg;

35 Xaa at position 27 is Asn, Cys, Arg, Leu, His, Met, Pro;

Xaa at position 28 is Gly, Asp, Ser, Cys, Ala, Lys, Asn,

Thr, Leu, Val, Glu, Phe, Tyr, Ile or Met;

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Xaa at position 29 is Glu, Asn, Tyr, Leu, Phe, Asp, Ala,
                      Gln, Arg, Thr, Gly or Ser;
     Xaa at position 30 is Asp, Ser, Leu, Arg, Lys, Thr, Met,
                 Trp, dlu, Asn, Gln, Ala or Pro;
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     Xaa at position 31\is Gln, Pro, Phe, Val, Met, Leu, Thr,
                 Lys, Ash, Asn, Arg, Ser, Ala, Ile, Glu, His or Trp;
     Xaa at position 32 is Asp, Phe, Ser, Thr, Cys, Glu, Asn,
                 Gln, Lys, \His, Ala, Tyr, Ile, Val or Gly;
     Xaa at position 33 is 1/1e, Gly, Val, Ser, Arg, Pro, or His;
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     Xaa at position 34 is Leu, Ser, Cys, Arg, Ile, His, Phe,
                 Glu, Lys, Thr, Ala, Met, Val or Asn;
     Xaa at position 3/5 is Met, Arg, Ala, Gly, Pro, Asn, His, or Asp;
     Xaa at position β6 is Glu, Leu, Thr, Asp, Tyr, Lys, Asn,
                 Ser, Ala, Ile, Val, His, Phe, Met or Gln;
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     Xaa at position 37 is Asn, Arg, Met, Aro, Ser, Thr, or His;
     Xaa at position \beta 8 is Asn, His\ Arg, Ld\, \betaly, Ser, or Thr;
     Xaa at position 39 is Leu, Thr,\Ala, Gl\\, Gl\\, Pro, Lys, Ser, or
                 Met:
     Xaa at position 40\is Arg, Asp, I\text{te, Ser}
                                                Wal, Thr, Gln,
                 Asn, Lya, His, Ala or Leu;
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     Xaa at position 41 is Arg, Thr, Val Ser Leu, or Gly;
     Xaa at position 42 is Rro, Gly, Cys,\Ser
                                               Gln \Glu, Arg,
                 His, Thr, Ala, Tyr, Phe,
                                           Leu, Val or Lys;
     Xaa at position 43 is Asn or Gly;
     Xaa at position 44 is Leu, Ser, Asp, Arg, Gln, Val, or Cys;
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     Xaa at position 45 is Glu, Tyr, His, Led, Pro, or Arg;
     Xaa at position 46 is Ala, Ser, Pro, Tyr \ Asn, or Thr;
     Xaa at position 47 is Phe, Asn, Glu, Pro,\Lys, Arg, or Ser;
     Xaa at position 48 is Asn, His, Val, Arg, Pro, Thr, Asp, or Ile;
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     Xaa at position 49 is Arg, Tyr, Trp, Lys, Ser, His, Pro, or Val;
     Xaa at position 50 is Ala, Asn, Pro, Ser, on Lys;
     Xaa at position 51 is Val, Thr, Pro, His, Let, Phe, or Ser;
     Xaa at position 52 is Lys, Ile, Arg, Val, Asn, Glu, or Ser;
     Xaa at position 53 is Ser, Ala, Phe, Val, Gly Asn, Ile, Pro, or
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                 His;
     Xaa at position 54 is Leu, Val, Trp, Ser, Ile, Phe, Thr, or His;
     Xaa at position 55 is Gln, Ala, Pro, Thr, Glu, Arg, Trp, Gly, or
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Leu; Xaa at position 56 is Asn, Leu, Val, Trp, Pro, or Ala; Xaa at position 57 is Ala, Met, Leu, Pro, Arg, Glu, Thr, Gln,\Trp, or Asn; Xaa at position 5% is Ser, Glu, Met, Ala, His, Asn, Arg, or Asp; Xaa at position 59\is Ala, Glu, Asp, Leu, Ser, Gly, Thr, or Arg; Xaa at position 60 \(\frac{1}{4}\)s Ile, Met, Thr, Pro, Arg, Gly, Ala; Xaa at position 61 is Glu, Lys, Gly, Asp, Pro, Trp, Arg, Ser, Gln, Leu; Xaa at position 62 is Sar, Val, Ala, Asn, Trp, Glu, Pro, Gly, or Asp Xaa at position 63 is Ile, Ser, Arg, Thr, or Leu; Xaa at position 64 is Leu, \Ala, Sex, Glu, Phe, Gly, or Arg; Xaa at position 65 is Lys, Thr, Gly, Asn, Met, Arg, Ile, or Asp; Xaa at position 66 is Asn, Tap, Val, Gly, Thr, Leu, Glu, or Arg; Xaa at position 67 is Leu, Gln, Gly, Ala, Trp, Arg, Val, or Lys; Xaa at position 48 is Leu, Gln \ Lys, Ttp, \Arg, Asp, Glu, Asn, His, Thr, Ser, Ala, Tyt, he, Ile, Met or Val; Xaa at position 69 is Pro, Ala, Thr, Trp, Akg, or Met; Xaa at position 70 is Cys, Glu, Gly, Arg, Met, or Val; Xaa at position 71 is Leu, Asn, Val, or Gln; Xaa at position 72 is Pro, Cys, Arg Ald, or Lys; Xaa at position 73 is Leu, Ser, Trp, or Gly; Xaa at position 74 is Ala, Lys, Arg, Val, or Tro; Xaa at position 75 is Thr, Asp, Cys, Neu, Val, Olu, His, Asn, or Ser; Xaa at position 76 is Ala, Pro, Ser, Thr, Gly, Asp, Ile, or Met; Xaa at position 77 is Ala, Pro, Ser, Thr, Phe, Leu, Asp, or His; Xaa at position 78 is Pro, Phe, Arg, Ser, Lys, His, Ala, Gly, Ile or Leu; Xaa at position 79 is Thr, Asp, Ser, Asn, Pro, Ala, Leu, or Arg; Xaa at position 80 is Arg, Ile, Ser, Glu, Neu, Val, Gln, Lys, His, Ala or Pro; Xaa at position 81 is His, Gln, Pro, Arg, Vall, Leu, Gly, Thr, Asn, Lys, Ser, Ala, Trp, Phe, Ile or Tyr;

Xaa at position 82 is Pro, Lys, Tyr, Gly, Ile\ or Thr;

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96 Xaa at position 83 is Ile, Val, Lys, Ala, or Asn; Xaa at position\84 is His, Ile, Asn, Leu, Asp, Ala, Thr, Glu, Gln, Ser, Phe, Met, Val, Lys, Arg, Tyr or Pro; Xaa at position 85\is Ile, Leu, Arg, Asp, Val, Pro, Gln, Gly, Set, Phe, or His; Xaa at position 86 ig Lys, Tyr, Leu, His, Arg, Ile, Ser, Gln, Pro; Xaa at position 87 is \asp\ Pro, Met, Lys, His, Thr, Val, Tyr, Glu, Akn, Ser, Ala, Gly, Ile, Leu or Gln; Xaa at position 88 is Gl\(\frac{1}{3}\), Leu, Glu, Lys, Ser, Tyr, or Pro; Xaa at position 89 is Asp \ or Ser; Xaa at position 90 is Trp, \Val, Cys, Tyr, Thr, Met, Pro, Leu, Gla, Lys, Ala, Phe, or Gly; Xaa at position 1 is Asn, Pro, Ala, Phe, Ser, Trp, Gln, Tyr, Leu, Lys, Ile, Asp, or His; Xaa at position 92 is Glu, Ser Ala, Lxs, Thr, Ile, Gly, or Pro; Xaa at position 94 is Arg, Lys, Asp, Leu Thr, Ile, Gln, Hid, Ser, Ala, or Pro; Xaa at position 95 is Arg, Thr, Pto, Gl, Tyr, Leu, Ser, or Gly; Xaa at position \96 is Lys, Asn, Tht, Leu\ Gln, Arg, His, Glu, Ser, Ala or Trp; Xaa at position 9 is Leu, Ile, Arg, Asp, or Mot; Xaa at position 98 \s Thr, Val, Gln, \Tyr, Glu, His, Ser, or Phe; Xaa at position 99 is Phe, Ser, Cys, His Gly, Trp, Tyr, Asp, Lys, Deu, Ile, Val or Asn; Xaa at position 100 is Tyx, Cys, His, Aer, Trp Arg, or Leu; 25 Xaa at position 101 is Leu, Asn, Val, Pro, Arg, Ala, His, Thr, Trp, or Met; Xaa at position 102 is Lys, Leu, Pro, Thr, Met, Asp, Val, Glu, Arg, Trp, Ser, Asn, His, \Ala, Tyt, Phe, Gln, or 30 Ile; Xaa at position 103 is Thr, Ser, Asn, Ile, Trp, Lys, or Pro; Xaa at position 104 is Leu, Ser, Pro, Ala, dlu, Cys, Asp, or Tyr; Xaa at position 105 is Glu, Ser, Lys, Pro, Leu, Thr, Tyr, or Arg; Xaa at position 106 is Asn, Ala, Pro, Leu, His, Val, or Gln; Xaa at position 107 is Ala, Ser, Ile, Asn, Pro. Lys, Asp, or Gly; 35

Xaa at position 108 is Gln, Ser, Met, Trp, Arg \ Phe, Pro,

His, Ile, Tyr, or Cys;

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Xaa at position 109 is Ala, Met, Glu, His, Ser, Pro, Tyr, or Leu;

wherein from 4 to 44 of the amino acids designated by Xaa are different from the corresponding native amino acids of (1-133) human interleukin-3;

R2 is a hematopoietic growth factor;

L is a linker capable of Linking R_1 to R_2 ;

10 and said chimera protein can additionally be preceded by (methionine), (alanine 1), or (methionine 2, alanine 1); and

- (d) harvesting said cultured stem cells; and
 (d) transplanting said cultured stem cells
 into said patient.
- 22. A method for treatment of a patient having a hematopoietic disorder, comprising the steps 20 of;
 - (a) removing stem cells from said patient or a donor;
- (b) culturing said stem cells with a selected growth medium comprising a chimera protein having the formula selected from the group consisting of:

 R_1-L-R_2 , R_2-L-R_1 , R_1-R_2 , R_2+R_1 , R_1-L-R_1 and R_1-R_1

30 wherein R_1 is a human interleukin-3 mutant polypeptide of SEQ ID NO:7

wherein m is 0 or 1; Xaa at position 18 is Asn or Ile; Xaa at position 19 is Met, Ala or Ile; Xaa at position 20 is Ile, Pro or Leu; Xaa at position 23 is Ile, Ala or Leu; Xaa at position 25 is Thr or His; Xaa at position 29 is Gln, Arg, Val or Leu; Xaa at position 32

is Leu, Ala, Asn|or Arg; Xaa at position 34 is Leu or Ser; Xaa at position 37 is Phe, Pro, or Ser; Xaa at position 38 is Ash or Ala; Xaa at position 42 is Gly, Ala, Ser, Asp or Asn; Xaa at position 45 is Gln, Val, or Met; Xaa at posi\tion 46 is Asp or Ser; Xaa at 5 position 49 is Met, \Ile, Leu or Asp; Xaa at position 50 is Glu or Asp; Xaa at position 51 is Asn Arg or Ser; Xaa at position 55 is\Arg, Leu, or Thr; Xaa at position 56 is Pro or Ser; Xaa at position 59 is Glu or Leu; Xaa at position 60 is Ala dr Ser; Xaa at position 62 is 10 Asn, Val or Pro; Xaa at\position 63 is Arg or His; Xaa at position 65 is Val or\Ser; Xaa at position 67 is Ser, Asn, His or Gly; Xaa at position 69 is Gln or Glu; Xaa at position 73 is Ala or Gly, Xaa at position 76 is Ser, Ala or Pro; Xaa at position 79 is Lys, Arg 15 or Ser; Xaa at posi/tion 82\is Leu, Glu, Val\ or Trp; Xaa at position 85 is Leu or Val; Xaa at position 87 is Leu, Ser, Trp; Xaa at position 88 is Ala or Trp; Xaa at position 91 is Ala or Pro; Xaa at position 93 is Pro or Ser; Xaa at position 95 is His or Thr; Xaa at position 20 98 is His, Ile, or thr; Xaa at position \100 is Lys or Arg; Xaa at position\101 is Asp, Ala or Met; Xaa at position 105 is Asn or Gln; Xaa at position 109 is Arg, Glu or Leu; Xaa at posttion 112\is Thr or Gln; Xaa at 25 position 116 is Lys, Val, Trp or Ser; Xaa at position 117 is Thr or Ser; Xaa at position 120 is Asn, Gln, or His; Xaa at position 123 is Ala or Glu; with the proviso that from four to forty-four of the amino acids designated by Xaa are different from the corresponding

R2 is a hematopoietic growth factor

L is a linker capable of Linking R₁ to R₂;

35 and said chimera protein can additionally be preceded by (methionine), (alanine), or (methionine , alanine); and

amino acids of native human interleukin-3);

(c) harvesting said cultured stem cells; and

(d) transplanting said cultured stem cells into said patient.

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23. A method for treatment of a patient having a hematopoietic disorder, comprising the steps of;

10 (a) removing stem cells from said patient or a donor;

(b) culturing said stem cells with a selected growth medium comprising a chimera protein having the formula selected from the group consisting of:

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 R_1-L-R_2 , R_2-L-R_1 , R_1-R_2 , R_2-R_1 , R_1-L-R_1 and R_1-R_1

wherein R₁ is a human interleukin-3 mutant polypeptide of SEQ ID NO:8

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wherein m is 0 or 1; n is 0 or 1) p is 0 or 1; Xaa at position 4 is Asn or Ile; Xaa at position 5 is Met, Ala or Ile: Xaa at postition 6 is Ile, Pro ot Deu; Xaa at position 9 is Ile, Ala or Leu; Xaa \at pds \tion 11 is Thr or His; Xaa at position 15 is Gin, Arg Val or Leu; Xaa at position 18 is\Leu, Ala, Asn \pr \rg;\X\aa at position 20 is Leu or Ser; Xaa at position 28 \is Phe, Pro, or Ser; Xaa at position 24 is Ask or Ala; Xaa at position 28 is Gly, Ala, Ser, Asp or Asn; Xaa at position 31 is Gln, Val, or Met; Xaa at\positi\dagger n 32 is Asp or Ser; Xaa at position 35 is Met, 1/le, Leu\or Asp; Xaa at position 36 is Glu or Asp; Xaa at\positioh 37 is Asn, Arg or Ser; Xaa at position 41 is Arg, Leu, or Thr; Xaa at position 42 is Pro or Ser; Xaa at position 45 is Glu or Leu; Xaa at position 46 is Ala or Ser; Xaa at position 48 is Asn, Val or Pro; Xaa at p ϕ sition 49 is Arg or His; Xaa at position 51 is Val or Ser; Xaa at

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position 53 \s Ser, Asn, His or Gly; Xaa at position 55 is Gln or Glu\ Xaa at position 59 is Ala or Gly; Xaa at position 62 is\Ser, Ala or Pro; Xaa at position 65 is Lys, Arg or Ser \ Xaa at position 67 is Leu, Glu, or Val; Xaa at position 68 is Leu, Glu, Val or Trp; Xaa at position 71 is Leu or Val; Xaa at position 73 is Leu, Ser or Trp; Xaa at position 74 is Ala or Trp; Xaa at position 77 is Ala or Pro; Xaa at position 79 is Pro or Ser; Xaa at position 81 is His or Thr; Xaa at position 84 is His, tle or Thr; Xaa at position 86 is Lys or Arg; Kaa at position 87 is Asp, Ala or Met; Xaa at position/91 is Asn or Glu Xaa at position 95 is Arg, Glu, Leu; Xaa at position 98 Thr or Gln; Xaa at position 102 is Lys, Val, Trp or Ser; Xaa at position 103 is Thr br Ser; Xaa at position 106 is Asn, Gln, or His; Xaa at position 109 is Ala or Glu; with the proviso that from four to forty-four of the amino acids

 R_2 is a hematopoietic growth/factor;

designated by Xaa are different from the corresponding

amino acids of native (15-125)human http://terleukin-3;

L is a linker capable of Linking R1 to R2; and said chimera protein can additionally be preceded by (methionine 1), (alanine 1), or (methionine 2, alanine 1); and

- (c) harvesting said cultured stem cells; and
- (d) transplanting said cultured stèm cells
- 30 into said patient.
 - 24. The method according to claim 1 wherein R1 is selected from the group consisting of:
- Asn Cys Ser Ile Met Ile Asp Glu Ile tle His His Leu Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn Ala Glu Asp Val Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro

Asn Leu Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln Gln SEQ ID NO:9;

Asn Cys Ser Ile Met Yle Asp Glu Ile Ile His His Leu Lys
Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn Ser
10 Glu Asp Met Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro
Asn Leu Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn
Ala Ser Ala Ile Glu Ser Yle Leu Lys Asn Leu Leu Pro Cys
Ala Ser Ala Thr Ala Ala Pro Thr Arg His Pro Ile His
Leu Pro Leu Ala Thr Ala Ala Pro Thr Arg Arg Lys Leu Thr
Ile Lys Asp Gly Asp Trp Asn Glu Rhe Arg Arg Lys Leu Thr
Ile NO:10;

Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
Val Pro Pro Ala Pro Ileu Leu Asp Ser Asn Asn Leu Asn Ser
Oliu Asp Met Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro
Asn Leu Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn
Ala Ser Ala Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys
Leu Pro Leu Ala Thr Ala Ala Pro Thr Arg His Pro Ile His
Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg Arg Lys Leu Thr
Oliu No:11;

Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys Gln Pro Pro Leu Pro Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp Gln Asp Ile Leu Met Glu Arg Asn Leu Arg Leu Pro Asn Leu Leu Ala Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Ala Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg Arg Lys Leu Thr Ile Lys Asp Gly Asp Trp Asn Ala Gln Ala Gln Gln SEQ ID NO:12;

Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp Gln Asp Ile Leu Met Glu Arg Asn Leu Arg Leu Pro Asn Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Ala Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln Gln SEQ ID NO:13;

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Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys Gln Pro Pro Leu Pro Ieu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp Gln Asp Ile Leu Met Glu Arg Asn Leu Arg Thr Pro Asn Leu Leu Ala Phe Val Arg Ala Val Lys His Leu Glu Asn Ala Ser Ala Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln Gln SEQ ID NO:14;

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Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala Phe Asn And Ala Val Lys Ser Leu Gln Asn Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Arg Iys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln Gln SEQ ID NO:15;

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Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Arg Lys Leu Thr

Phe Tyr Let Lys Thr Leu Glu Asn Ala Gln Ala Gln Gln SEQ ID NO:16;

Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly
Glu Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro
Asn Leu Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn
Ala Ser Ala Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys
Leu Pro Leu Ala Thr Ala Ala Pro Thr Arg His Pro Ile His
Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg Glu Lys Leu Thr
Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln Gln SEQ
ID NO:17;

Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly
Glu Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro
Asn Leu Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn
Ala Ser Ala Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys
Leu Pro Leu Ala Thr Ala Ala Pro Ihr Arg His Pro Ile His

10 Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg Glu Lys Leu Thr
Phe Tyr Leu Val Ser Leu Glu His Ala Gln Glu Gln Gln SEQ
ID NO:18;

Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly
Glu Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro
Asn Leu Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn
Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys
Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile

10 Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr
Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln Gln SEQ
ID NO:19;

Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
35 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly
Glu Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro
Asn Leu Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn

ID NO:21;

Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys Alà Gly Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Wal Thr Leu Glu Gln Ala Gln Glu Gln SEQ ID NO:20;

Asn Cys Ser Asn\Met Ile Asp Glu Ile Ile Thr His Leu Lys Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp Gln Asp The Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn 10 Ala Ser Gly Ile Gl $\dot{\chi}$ Ala Ile Leu Arg Asn Leu Val Pro Cys Leu Pro Ser Ala Thr\Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys Ala/Gly Asp Trp Sln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Ley Val Ser Leu Glu His Ala Gln Glu Gln SEQ 15

Asn Cys Ser Ile Met Ile Asp Gl to Ile His His Leu Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn Ala Glu Asp Val\Asp Ile Leu Met Glu\Arg Asp Leu Arg Leu Pro Asn Leu Glu Ser Phe Val Atg Ala Val Lys Asn Leu Glu Asn 20 Ala Ser Ala Ite Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn/Ala Gln Ala Gln Gln SEQ 25 ID NO:22;

Asn Cys Ser Ile Met Ile Asp Gl μ Ile Ile π His Leu Lys Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn Ser Glu Asp Met Asp Ile Leu Met Glu\Arg Asn Leu Arg Thr Pro Asn Leu Leu Ala Phe Val Arg Ala Val Lys His Leu Glu Asn 30 Ala Ser Ala Ile Glu Ser Ile Leu Lys Asn Leu\Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln Gln SEQ 35 ID NO:23;

Asn Cys Ser Ile Met Ile Asp Glu Ile | Tle His His Leu Lys

Val Pro Pro Ala Pro Leu Leu Asp Ser Asn Asn Leu Asn Ser Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Leu Pro Asn Leu Leu Ala Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Ala Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln Gln SEQ ID NO:24;

- Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His
 Leu Lys Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu
 Asn Gly Glu Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg
 Arg Pro Asn Leu Glu Ala Phe Asn Arg Ala Val Lys Ser Leu
 Gln Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln
 Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro
 Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys
 Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
 Gln SEQ ID NO:25;
- Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His
 Leu Lys Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu
 Asn Gly Glu Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg
 Arg Pro Asn Leu Glu Ala Phe Asn Arg Ala Val Lys Ser Leu
 Gln Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Val
 Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro
 Ile Thr Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys
 Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
 Gln SEQ ID NO:26;
- Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Ser Leu Glu His Ala Gln Glu Gln

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Gln SEQ ID NO:27;

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His
Leu Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu

5 Asn Ala Glu Asp Val Asp Ile Leu Met Glu Arg Asn Leu Arg
Leu Pro Asn Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu
Glu Asn Ala Ser Ala Ile Glu Ser Ile Leu Lys Asn Leu Leu
Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro Thr Arg His Pro
Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg Arg Lys

10 Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
Gln SEQ ID NO:28;

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His
Leu Lys Arg Pro Pro Asn Pro beu Leu Asp Pro Asn Asn Leu
15 Asn Ser Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg
Thr Pro Asn Leu Leu Ala Phe Val Arg Ala Val Lys His Leu
Glu Asn Ala Ser Ala Ile Glu Ser Ile Leu Lys Asn Leu Leu
Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro Thr Arg His Pro
Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg Arg Lys
20 Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
Gln SEQ ID NO:29;

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His
Leu Lys Val Pro Pro Ala Pro Leu Leu Asp Ser Asn Asn Leu

25 Asn Ser Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg
Leu Pro Asn Leu Leu Ala Rhe Val Arg Ala Val Lys Asn Leu
Glu Asn Ala Ser Ala Ile Glu Ser Ile Leu Lys Asn Leu Leu
Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro Thr Arg His Pro
Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg Arg Lys

30 Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
Gln SEQ ID NO:30;

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His
Leu Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu

35 Asn Ala Glu Asp Val Asp Ile Leu Met Glu Arg Asn Leu Arg
Leu Pro Asn Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu
Glu Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln

Pro Cys leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln Gln SEQ ID NO:31;

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Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn Ser Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr Pro Asn Leu Leu Ala Phe Val Arg Ala Val Lys His Leu Glu Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Gln Glu Gln Gln SEQ ID NO:32;

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Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys Val Pro Pro Ala Pro Leu Leu Asp Ser Asn Asn Leu Asn Ser Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Leu Pro Asn Leu Leu Ala Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln Gln SEQ ID NO:33;

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Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn Ala Glu Asp Val Asp Ile Leu Met Glu Arg Asn Leu Arg Leu Pro Asn Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln Gln SEQ ID NO:34;

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Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys Val Pro Pro Ala Pro Leu Leu Asp Ser Asn Asn Leu

Gln SEO ID NO:36;

Asn Ser Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Leu Pro Asn Leu Ala Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln Gln SEQ ID NO:35;

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His

10 Leu Lys Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu
Asn Ser Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg
Thr Pro Asn Leu Leu Ala Phe Val Arg Ala Val Lys His Leu
Glu Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Val
Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro

15 Ile Thr Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys
Leu Thr Phe Tyr Leu Val Ser Leu Glu His Ala Gln Glu Gln

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His

20 Leu Lys Val Pro Pro Ala Pro Leu Leu Asp Ser Asn Asn Leu
Asn Ser Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg
Leu Pro Asn Leu Leu Ala Phe Val Arg Ala Val Lys Asn Leu
Glu Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Val
Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro

25 Ile Thr Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys
Leu Thr Phe Tyr Leu Val Ser Leu Glu His Ala Gln Glu Gln
Gln SEQ ID NO:37;

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His

30 Leu Lys Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu
Asn Ser Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg
Thr Pro Asn Leu Leu Ala Phe Val Arg Ala Val Lys His Leu
Glu Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Val
Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro

35 Ile Thr Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys
Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
Gln SEQ ID NO:38;

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Gln SEQ ID NO:40

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn Ala Glu Asp Val Asp Ile Leu Met Glu Arg Asn Leu Arg Leu Pro Asn Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Ser Leu Glu His Ala Gln Glu Gln Gln SEQ ID NO:39;

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His
Leu Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu
Asn Ala Glu Asp Val Asp Ile Leu Met Asp Arg Asn Leu Arg
15 Leu Ser Asn Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu
Glu Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln
Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro
Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys
Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ala Ile His His Leu Lys Arg Pro Pro Ala Pro Ser Leu Asp Pro Asn Asn Leu Asn Asp Glu Asp Met Ser Ile Leu Met Glu Arg Asn Leu Arg Leu Pro Asn Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln 30 Gln SEQ ID NO:41;

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His
Leu Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu
Asn Asp Glu Asp Met Ser Ile Leu Met Glu Arg Asn Leu Arg
Leu Pro Asn Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu
Glu Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln
Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro

Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln Gln SEQ ID NO: 42;

- Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn Ala Glu Asp Val Asp Ile Leu Met Asp Arg Asn Leu Arg Leu Pro Asn Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln Gln Glu Gln Gln SEQ ID NO:43;
- Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His
 Leu Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu
 Asn Asp Glu Asp Val Ser Ile Leu Met Glu Arg Asn Leu Arg
 Leu Pro Asn Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu
 Glu Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln
 20 Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro
 Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys
 Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
 Gln SEQ ID NO:44;
- Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn Asp Glu Asp Met Ser Ile Leu Met Glu Arg Asn Leu Arg Leu Pro Asn Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln Glu Gln Gln SEQ ID NO:45;
- Met Ala Tyr Pro Glu Thr Asp Tyr Lys Asp Asp Asp Asp Lys Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn Ala

Glu Asp Val Asp Ile Leu Met Glu Arg Asn Leu Arg Leu Pro Asn Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln Gln SEQ ID NO:46;

Met Ala Tyr Pro Glu Thr Asp Tyr Lys Asp Asp Asp Asp Lys

Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys

Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn Ser

Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr Pro

Asn Leu Leu Ala Phe Val Arg Ala Val Lys His Leu Glu Asn

Ala Ser Gly Ile Glu Ala Ile beu Arg Asn Leu Gln Pro Cys

Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile

Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr

Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln SEQ

ID NO: 47; and

- Met Ala Asn Cys Ser Ile Met Ile Asp Glu Leu Ile His His
 Leu Lys Ile Pro Pro Asn Pro Ser Leu Asp Ser Ala Asn Leu
 Asn Ser Glu Asp Val Ser Ile Leu Met Glu Arg Asn Leu Arg
 Thr Pro Asn Leu Leu Ala Phe Val Arg Ala Val Lys His Leu
 Glu Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln
 25 Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro
 Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys
 Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
 Gln SEQ ID NO:48.
- wherein is R2 is R1 or a hematopoietic growth factor selected from the group consisting of: GM-CSF, CSF-1, G-CSF, G-CSF Ser¹⁷, c-mpl ligand (MGDF or TPO), M-CSF, erythropoietin (EPO), IL-1, IL-2, IL-3, IL-4, IL-5, IL-3, IL-16, LIF, flt3 ligand, human growth hormone, B-cell growth factor, B-cell differentiation factor,

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eosinophil differentiation factor and stem cell factor (SCF);

- 26. The method of claim 25 wherein is R₂ is selected from the group consisting of G-CSF, G-CSF Ser¹⁷, flt3 ligand and c-mpl ligand.
- 27. The method of claim 21 wherein said chimera protein is selected from group consisting of:

 10 SEQ ID NO:121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 165, 166, 167 and 168.

28. The method of claim 28 wherein said chimera protein is selected from group consisting of: SEQ ID NO:124, SEQ ID NO:133, SEQ ID NO:154 and SEQ ID NO:155.

29. The method of claim 20, 21, 22, 23, 24, 27 or 28 wherein said culture medium further comprises a hematopoietic growth factor selected from the group consisting of: GM-CSF, CSF-1, G-OSF, G-OSF Ser¹⁷, c-mpl ligand (MGDF or TPO), M-CSF, erythropoietin (EPO), IL-1, IL-4, IL-2, IL-5, IL-6, IL-7, IL-8, IL-9, IL-10, IL-11, IL-12, IL-13, IL-15, IL-16, LIF, flt3 ligand, human growth hormone, B-cell growth factor, B-cell differentiation factor, eosinophil differentiation

30. The method of claim 25 wherein said culture medium further comprises a hematopoietic growth factor selected from the group consisting of: GM-CSF, CSF-1, G-CSF, G-CSF Ser¹⁷, c-mpl ligand (MGDF or TPO), M-CSF, erythropoietin (EPO), IL-1, IL-4, IL-2, IL-5, IL-6, IL-7, IL-8, IL-9, IL-10, IL-11, IL-12, IL-13, IL-

15, IL-16, LIF, flt3 ligand, human growth hormone, B-cell growth factor, B-cell differentiation factor, eosinophil differentiation factor and stem cell factor (SCF).

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- 31. The method of claim 26 wherein said culture medium further comprises a hematopoietic growth factor selected from the group consisting of: GM-CSF, CSF-1, G-CSF, G-CSF Ser¹⁷, c-mpl ligand (MGDF or TPO), M-CSF, erythropoietin (EPO), IL-1, IL-4, IL-2, IL-5, IL-6, IL-7, IL-8, II-9, IL-10, IL-11, IL-12, IL-13, IL-15, IL-16, LIF, flt3 ligand, human growth hormone, B-cell growth factor, B-cell differentiation factor, eosinophil differentiation factor and stem cell factor (SCF).
- 32. The method of claim 20 wherein said mutant human interleukin-3 polypeptide has at least three times greater activity than native human interleukin-3, in at least one assay selected from the group consisting of: AML cell proliferation, TF-1 cell proliferation and Methylcellulose assay.
- 33. The method of claim 25 wherein said
 25 mutant human interleukin-3 polypeptide has at least
 three times greater activity than native human
 interleukin-3, in at least one assay selected from the
 group consisting of: AML cell proliferation, TF-1 cell
 proliferation and Methylcellulose assay.

- 34. The method of claim 20 further comprising the step of separating the stem cells from a mixed population of cells prior to culturing the stem cells.
- 35. The method of claim 34 wherein said stem cells are separated from a mixed population of cells based on the stem cells having CD34 surface antigen.

36. A method of human gene therapy, comprising the steps of;

(a) removing stem cells from a patient or donor

(b) culturing said stem cells with a selected growth medium comprising a chimera protein having the formula selected from the group consisting of:

 R_1-L-R_2 , R_2-L-R_1 , R_1-R_2 , R_2-R_1 , R_1-L-R_1 and R_1-R_1

wherein R_1 is a human interleukin-3 mutant polypeptide of SEQ ID NO:1

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wherein

Xaa at position 17 is Ser, Lys, Gly, Asp, Meth Gln or Arg;

Xaa at position 18 is Asn, His, Leu, Ile, Phe Arg, or Gln; Xaa at position 19 is Met, Phe, Ile, Arg, Gly, Ala, or Cys;

20 Xaa at position 20 is le, Cys, Gli, Glu, Arg, Pio, or Ala;

Xaa at position 21 is Asp, Phe, Lys Arg, Ala, Gly, Glu,

Gln, Asn, Thr, Ser or Val;

Xaa at position 22 is Glu Trp, Pro, Ser, Ala, His, Asp,

Asn, Gln, Leu, Val or Gly;

25 Xaa at position 23 is Ile, Val, Ala, Leu, Ay, Trp, Lys,

Phe, Ser, or Arg;

Xaa at position 24 is Ile, Gly, Val, Arg Ser, Phe, or Leu;

Xaa at position 25 is Thr, His, Gly, Gln, Arg, Pro, or Ala;

Xaa at position 26 is His, Thr, Phe, Gly, Arg, Ala, or Trp;

30 Xaa at position 27 is Leu, Gly, Arg, Thr, Fer, or Ala;

Xaa at position 28 is Lys, Arg, Leu, Gln, Gly, Pro, Val or Trp;

Xaa at position 29 is Gln, Asn, Leu, Pro, Atg, or Val;

Xaa at position 30 is Pro, His, Thr, Gly, Asp, Gln, Ser, Leu, or

Lys;

Xaa at position 31 is Pro, Asp, Gly, Ala, Arg, Leu, or Gln;
Xaa at position 32 is Leu, Val, Arg, Gln, Asn, Gly, Ala, or Glu;
Xaa at position 33 is Pro, Leu, Gln, Ala, Thr, or Glu;

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Xaa at position 34 is Leu, Val, Gly, Ser, Lys, Glu, Gln,
                 Thr,\Arg, Ala, Phe, Ile or Met;
    Xaa at position 3 is Leu, Ala, Gly, Asn, Pro, Gln, or Val;
     Xaa at position 36\is Asp, Leu, or Val;
    Xaa at position 37 \( \frac{1}{4}\)s Phe, Ser, Pro, Trp, or Ile;
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     Xaa at position 38 is Asn, or Ala;
     Xaa at position 40 is Leu, Trp, or Arg;
     Xaa at position 41 is Asn, Cys, Arg, Leu, His, Met, or Pro;
     Xaa at position 42 is Gly, Asp, Ser, Cys, Asn, Lys, Thr,
                 Leu, Val, Gl\psi, Phe, Tyr, Ile, Met or Ala;
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     Xaa at position 43 is Glu \ Asn, Tyr, Leu, Phe, Asp, Ala,
                  Cys, Gln, Arg, Thr, Gly or Ser;
     Xaa at position 44 is Asp, Ser, Leu, Arg, Lys, Thr, Met,
                  Trp,/Glu, Asn, Gln, Ala or Pro;
     Xaa at position 45 is Gln, Pro, Phe, Val, Met, Leu, Thr,
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                  Lys, Trp, Asp, Asn Arg, Set Ala, Ile, Glu or His;
     Xaa at position 46 is Asp, Phe, Ser, Thr, \\chixs, Glu, Asn,
                  Gln, Lys, His, Ala, Tyr, Ile, Wal or Gly;
     Xaa at position 4 \( \) is Ile, Gly, \( \)(al, Ser, A\)(g, \( \)(pro, or His;
     Xaa at position 48 \is Leu, Ser, C\s, Arg, Ile, His, Phe,
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                  Glu, Lys, Thr, Ala, Met, Val or An;
     Xaa at position 49 is Met, Arg, Ala, Gly, Pro, Asn, His, or Asp;
      Xaa at position 50 is tu, Leu, Thr, Asp, Tr, Lys,
                  Ser, Ala, Ile, Val, His, Phe, Met or Gln;
     Xaa at position 51 is Asn Arg, Met, Pro Ser, Thr or His;
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      Xaa at position 52 is Asn, Ais, Arg, Ist, Gly, Ser, or Thr;
      Xaa at position 53 is Leu, Thr, Ala, Gly, Glu, Pro, Lys,
                  Ser, or Met;
      Xaa at position 54 is Arg, Asp, Ile, Ser, Val, Thr, Gla,
                   Asn, Lys, His, Ala or Leu;
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      Xaa at position 55 is Arg, Thr, Val, Ser, Leu, or Gly;
      Xaa at position 56 is Pro, Gly, Cys, Ser, Gln, Glu, Arg,
                   His, Thr, Ala, Tyr, Phe, Leu, Val or Lys;
      Xaa at position 57 is Asn or Gly;
      Xaa at position 58 is Leu, Ser, Asp, Arg, Gln, Val, or Cys;
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      Xaa at position 59 is Glu, Tyr, His, Leu, Pr\phi, or Arg;
      Xaa at position 60 is Ala, Ser, Pro, Tyr, Asn, or Thr;
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Xaa at position 61 is Phe, Asn, Glu, Pro, Lys, Arg, or Ser;
    Xaa at position 62 is Asn, His, Val, Arg, Pro, Thr, Asp, or Ile;
    Xaa at position &3 is Arg, Tyr, Trp, Lys, Ser, His, Pro, or Val;
     Xaa at position 64 is Ala, Asn, Pro, Ser, or Lys;
    Xaa at position 65\is Val, Thr, Pro, His, Leu, Phe, or Ser;
 5
     Xaa at position 66 ks Lys, Ile, Arg, Val, Asn, Glu, or Ser;
     Xaa at position 67 ia Ser, Ala, Phe, Val, Gly, Asn, Ile, Pro, or
                 His:
     Xaa at position 68 is \etaeu, Val, Trp, Ser, Ile, Phe, Thr, or His;
     Xaa at position 69 is Gan, Ala, Pro, Thr, Glu, Arg, Trp, Gly, or
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     Xaa at position 70 is Asn\ Leu, Val, Trp, Pro, or Ala;
     Xaa at position 71 is Ala, Met, Leu, Pro, Arg, Glu, Thr,
                 Gln,/Trp, or Ash;
     Xaa at position 72 is Ser, Glu, Met, Ala, His, Asn, Arg, or Asp;
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     Xaa at position 73 is Ala, Glu, Asp, Leu, Ser, Gly, Thr, or Arg;
     Xaa at position 74 is Ile, Met, Thr, Pro, Akg, Gly, Ala;
     Xaa at position 75 is Glu, Lys, Gly, Asp Pro Trp, Arg,
                  Set, Gln, or Leu;
     Xaa at position 76 is Ser, Val, Ala, Asn, Trp, Glu, Pro, Gly, or
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                  Asp
     Xaa at position 7 is Ile, Ser, Arg, Thr, or Leu;
     Xaa at position 78 is Leu, Ala, Ser, Glu, Phe Gly, or Arg;
     Xaa at position 79 is Lys, Thr, Asn Met, Arg, Ile, Gly, or Asp;
     Xaa at position 80 is Asn, Trp, Val, Gly, Thr, Leu, Glu, or Arg;
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      Xaa at position 81 is Leu, Gln, Gly, Ala, Trp, Arg, Val, or Lys;
      Xaa at position 82 is Lew, Gln, Lys, trp,/Arg, Asp, Glu, Asn, His,
                  Thr, Ser, Ala, Tyr, Phe, 11, Met or Val;
      Xaa at position 83 is Pro, Ala, Thr, Tip, Arg, or Met;
      Xaa at position 84 is Cys, Glu, Gly, Art, Met, or Val;
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      Xaa at position 85 is Leu, Asn, Val, or \Gln;
      Xaa at position 86 is Pro, Cys, Arg, Ala or Lys;
      Xaa at position 87 is Leu, Ser, Trp, or q_{1y};
      Xaa at position 88 is Ala, Lys, Arg, Val, or Trp;
      Xaa at position 89 is Thr, Asp, Cys, Leu, Val, Glu, His, Asn, or
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                   Ser;
      Xaa at position 90 is Ala, Pro, Ser, Thr, Gly, Asp, Ile, or Met;
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Xaa at position 91 is Ala, Pro, Ser, Thr, Phe, Leu, Asp, or His;
Xaa at position 92 is Pro, Phe, Arg, Ser, Lys, His, Ala,
Gly, Ile or Leu;

Xaa at position 93 is Thr, Asp, Ser, Asn, Pro, Ala, Leu, or Arg;

5 Xaa at position 4 is Arg, Ile, Ser, Glu, Leu, Val, Gln,

Lys, His, Ala, or Pro;

Xaa at position 95 ks His, Gln, Pro, Arg, Val, Leu, Gly,

Thr, Asn, Lys, Ser, Ala, Trp, Phe, Ile, or Tyr;

Xaa at position 96 is tro, Lys, Tyr, Gly, Ile, or Thr;

10 Xaa at position 97 is Ile, Val, Lys, Ala, or Asn;

Xaa at position 98 is His Ile, Asn, Leu, Asp, Ala, Thr,

Glu, Gln, Ser, Phe, Met, Val, Lys, Arg, Tyr or Pro;

Xaa at position 99 is Ile, Neu, Arg, Asp, Val, Pro, Gln,

Gly, Ser, Phe, or His;

15 Xaa at position 100 is Lys, Tyr, Leu, His, Arg, Ile, Ser, Gln, or Pro;

Xaa at position 101 is Asp, Pro, Met, Lys, His, Thr, Val,

tyr, Glu, Asn, Ser, Ala, Gly, The, Leu, or Gln;

Xaa at position 102 is Gly, Leu, Glu, Lys, Set, Tyr, or Pro;

20 Xaa at position 103 is Asp, or Ser;

Xaa at position 104 is Trp, Val, Cys Tyr, Thr, Met, Pro,

Leu, aln, Lys, Ala, Phe, or Gly;

Xaa at position 105 is Asn, Pro, Ala, Phe, Ser, Thp, Gln,

Tyr, Leu, Lys, Ile, Asp, or His

25 Xaa at position 106 is Glu Ser, Ala, Lys Thr, Ile Gly, or Pro; Xaa at position 108 is Arg, Lys Asp, Leu, Thr, Ile, Gln,

His, Ser, Ala or Pro;

Xaa at position 109 is Arg, Thr, Pro, Glu, Tyr, Leu, Ser, or Gly; Xaa at position 110 is Lys, Ala, Asn, Thr, Leu, Arg, Gla,

30 His, Glu, Ser, or Trp;

Xaa at position 111 is Leu, Ile, Arg, Asp, of Met;

Xaa at position 112 is Thr, Val, Gln, Tyr, Glt, His, Ser, or Phe;

Xaa at position 113 is Phe, Ser, Cys, His, Gly Trp, Tyr,

Asp, Lys, Leu, Ile, Val or Asn;

Xaa at position 114 is Tyr, Cys, His, Ser, Trp, Arg, or Leu;
Xaa at position 115 is Leu, Asn, Val, Pro, Arg, Ala, His,
Thr, Trp, or Met;

Xaa at position 116 is Lys, Leu, Pro, Thr, Met, Asp, Val, Glu, Arg, Trp, Ser, Asn, His, Ala, Tyr, Phe, Gln, or Ile;

Xaa at position 117 is Thr, Ser, Asn, Ile, Trp, Lys, or Pro;

Xaa at position 118 is Leu, Ser, Pro, Ala, Glu, Cys, Asp, or Tyr;

Xaa at position 120 is Glu, Ser, Lys, Pro, Leu, Thr, Tyr, or Arg;

Xaa at position 121 is Asn, Ala, Pro, Leu, His, Val, or Gln;

Xaa at position 121 is Ala, Ser, Ile, Asn, Pro, Lys, Asp, or Gly;

Xaa at position 122 is Gln, Ser, Met, Trp, Arg, Phe, Pro,

10 His, Ile, \(\Tyr\), or Cys;

Xaa at position 123 is Ala, Met, Glu, His, Ser, Pro, Tyr, or Leu;

wherein from 1 to 14 amino acids can be deleted from the N-terminus and/or from 1 to 15 amino acids can be deleted from the C-terminus of said human interleukin-3 mutant polypeptide; and wherein from 4 to 44 of the amino acids designated by Xaa are different from the corresponding amino acids of native (1-133) human interleukin-3;

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R2 is a hematopoletic growth factor; and

L is a linker capable of Linking R₁ to R₂; and said chimera protein can additionally be preceded by (methionine -1), valanine -1, or (methionine , alanine); and

- (c) transducing DNA into said cultured cells;
- (d) harvesting said transduced cells; and
- (e) transplanting said transduced cells into said patient.
- 37. A method of human gene therapy, 35 comprising the steps of;
 - (a) removing stem cells from a patient or a

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donor; (b) culturing said stem cells with a selected growth med um comprising a chimera protein having the formula selected from the group consisting of: R_1-L-R_2 , R_2-L-R_1 , R_1-R_2 , R_2-R_1 , R_1-L-R_1 and R1-R1 wherein R₁ is a human interleukin-3 mutant polypeptide of SEQ ID NO:4 wherein Xaa at position is Sen, Lys, Gly, Asp, Met, Gln, or Arg; Xaa at position 4 is Asn His, Leu, Ile, Phe, Arg, or Gln; Xaa at posit on 5 is Met, Phe, Ile Arg, Gly, Ala, or Cys; Xaa at position 6 is Ile, dys, Gln, Glu, Arg, Pro, or Ala; Xaa at position 7 is Asp, Phe, Lys, Arg, Ala, Gly, Glu, Gln, Asn, Thr, Ser or Val Xaa at position 8 is Glu, Trp\ Pro, Set, Ala, His, Asp, Ash, Gln, Leu, Val\ or Gly; Xaa at position \9 is Ile, Val, Ala, Leu, Gly, Trp, Lys, Phe, Ser, or Arg; Xaa at position 10\is Ile, Gly, \dal, Arg, Ser, Phe, or Leu; Xaa at position 11 is Thr, His, Gly, Gin, Arg, Pro, or Ala; Xaa at position 12 is Nis, Thr, Phe, Sly, Arg, Ala, or Trp; Xaa at position 13 is Leu, Gly, Arg Thr, Ser, or Ala; Xaa at position 14 is Lys, Arg, Leu, Gln, Gly, Pro, Val or Trp; Xaa at position 15 is Gln, Asn, Leu, Pro, Arg, or Val; Xaa at position 16 is Pro, His, Thr, dly, Asp, Gla, Ser, Leu, or Lys; Xaa at position 17 is Pro, Asp, Gly, Ala, Arg, Leu, or Gln; Xaa at position 18 is Leu, Val, Arg, Glm, Asn, Gly, Ala, or Glu; Xaa at position 19 is Pro, Leu, Gln, Ala Thr, or Glu; Xaa at position 20 is Leu, Val, Gly, Ser, Lys, Glu, Gln, Thr, Arg, Ala, Phe, Ile or Met

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Xaa at position 21 is Leu, Ala, Gly, Asn, Pro, Gln, or Val;

Xaa at position 22 is Asp, Leu, or Val;

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Xaa at\position 23 is Phe, Ser, Pro, Trp, or Ile;
     Xaa at position 24 is Asn, or Ala;
     Xaa at position 26 is Leu, Trp, or Arg;
     Xaa at position 27 is Asn, Cys, Arg, Leu, His, Met, Pro;
     Xaa at position 28 is Gly, Asp, Ser, Cys, Ala, Lys, Asn,
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                 Thr, Leu, Val, Glu, Phe, Tyr, Ile or Met;
     Xaa at position\29 is Glu, Asn, Tyr, Leu, Phe, Asp, Ala,
                 Cys, \Gln, Arg, Thr, Gly or Ser;
     Xaa at position 3\Diamond is Asp, Ser, Leu, Arg, Lys, Thr, Met,
                 Trp, Glu, Asn, Gln, Ala or Pro;
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     Xaa at position 31 i Gln, Pro, Phe, Val, Met, Leu, Thr,
                           Asn, Arg, Ser, Ala, Ile, Glu, His or Trp;
                 Lys, Asp,
     Xaa at position 32 is Asp. Phe, Ser, Thr, Cys, Glu, Asn,
                 Gln, Lys, His, Ala, Tyr, Ile, Val or Gly;
     Xaa at position 33 is Ile, Gly, Val, Ser, Arg, Pro, or His;
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     Xaa at position 34 is Leu Ser, Cyb, Arg, Ile, His, Phe,
                 Glu, Lys, Thr,\Ala, Met,\Val or Asn;
     Xaa at position 35 is Met, Arg, Ala Fly, Pro, Asn, His, or Asp;
     Xaa at\position 36 is Glu, Leu, Thr, App, Tyr, Lys, Asn,
                 Ser, Ala, Ile, Val, His, Phe, Met or Gln;
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     Xaa at position 37 is Asn, Arg Met, Pro Ser, Thr, or His;
     Xaa at position 38 is Asn, His,\Arg, Leu,\Gly, Ser, or Thr;
     Xaa at position 39 is Leu, Thr, Ala, Gly, Glu, Pro, Lys, Ser, or
     Xaa at position 40 is Arg, Asp, Ide, Ser, Val, Thr, Gln,
25
                 Asn, Lys, His, Ala or Leu;
     Xaa at position 41 is Arg, Thr, Val, Ser, Leu, or Gly;
     Xaa at position 42 is Pro, Gly, Cys,\Ser, Gln\ Glu, Arg,
                 His, Thr, Ala, Tyr, Phe, Leu, Val or Lys;
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     Xaa at position 43 is Asn or Gly;
     Xaa at position 44 is Leu, Ser, Asp, Arg, Gln, Val, or Cys;
     Xaa at position 45 is Glu, Tyr, His, Led, Pro, or Arg;
     Xaa at position 46 is Ala, Ser, Pro, Tyr Asn, or Thr;
     Xaa at position 47 is Phe, Asn, Glu, Pro,\Lys, Arg, or Ser;
     Xaa at position 48 is Asn, His, Val, Arg, Pro, Thr, Asp, or Ile;
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     Xaa at position 49 is Arg, Tyr, Trp, Lys, $er, His, Pro, or Val;
     Xaa at position 50 is Ala, Asn, Pro, Ser, or Lys;
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Xaa at position 51 \is Val, Thr, Pro, His, Leu, Phe, or Ser;
      Xaa at position 52 \square statement statement is Lys, Ile, Arg, Val, Asn, Glu, or Ser;
      Xaa at position 53 it Ser, Ala, Phe, Val, Gly, Asn, Ile, Pro, or
                                His;
      Xaa at position 54 is Leu, Val, Trp, Ser, Ile, Phe, Thr, or His;
       Xaa at position 55 is aln, Ala, Pro, Thr, Glu, Arg, Trp, Gly, or
                                Leu;
       Xaa at position 56 is Asn, Leu, Val, Trp, Pro, or Ala;
       Xaa at position 57 is Ala\ Met, Leu, Pro, Arg, Glu, Thr,
                                 Gln, Trp, or Atn;
       Xaa at position 58 is Ser, Glu, Med, Ala, His, Asn, Arg, or Asp;
                                                                                    Leu, Ser, Gly, Thr, or Arg;
       Xaa at position 59/is Ala, Glu, Asp
       Xaa at position 60 is Ile, Met, Thr, tro, Arg, Gly, Ala;
       Xaa at position $1 is Glu, Lys Gly, Asp, Pro, Trp, Arg, Ser, Gln,
                                 or Leu;
        Xaa at position $2 is Ser, Val, $\langle \langle \langle \langle \rangle \rang
                                 Asp;
        Xaa at position 63 is Ile, Ser, Ard, Thr, or Leu;
        Xaa at position 64\is Leu, Ala, Ser\ Glu, Phe\ Gly, or Arg;
        Xaa at position 65 is Lys, Thr, Gly, Asn, Met, Arg, Ile, or Asp;
        Xaa at position 66 is Asn, Trp, Val / Cly, Thr, Leu, Glu, or Arg;
         Xaa at position 67 is Lau, Gln, Gly, Ala, Trp, Alg, Val, or Lys;
         Xaa at position 68 is Leu, Gln, Lys, Tro, Arg, Asp, Glu,
                                  Asn, His, Thr, Ser, Ala, Tyr, Phe, Ile Met or Val;
         Xaa at position 69 is Pro, Ala, Thr, Trp Arg, or Met;
         Xaa at position 70 is Cys, Glu, Gly, Arg, Met, or Vat;
         Xaa at position 71 is Leu, Asn, Val, or Glh;
          Xaa at position 72 is Pro, Cys, Arg, Ala, or Lys;
          Xaa at position 73 is Leu, Ser, Trp, or Gly
         Xaa at position 74 is Ala, Lys, Arg, Val, or Trp;
          Xaa at position 75 is Thr, Asp, Cys, Leu, Val Glu, His, Asn, or
                                    Ser;
          Xaa at position 76 is Ala, Pro, Ser, Thr, Gly, Asp, Ile, or Met;
          Xaa at position 77 is Ala, Pro, Ser, Thr, Phe, Leu, Asp, or His;
          Xaa at position 78 is Pro, Phe, Arg, Ser, Lys, His, Ala,
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                                    Gly, Ile or Leu;
          Xaa at position 79 is Thr, Asp, Ser, Asn, Pro, Ala, Leu, or Arg;
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Xaa at position 80 is Arg, Ile, Ser, Glu, Leu, Val, Gln, Lys, His, Ala or Pro;

Xaa at position 81 is His, Gln, Pro, Arg, Val, Leu, Gly,

Thr\ Asn, Lys, Ser, Ala, Trp, Phe, Ile or Tyr;

5 Xaa at position &2 is Pro, Lys, Tyr, Gly, Ile, or Thr;

Xaa at position 8 is Ile, Val, Lys, Ala, or Asn;

Xaa at position 84\is His, Ile, Asn, Leu, Asp, Ala, Thr,

Glu, Gla, Ser, Phe, Met, Val, Lys, Arg, Tyr or Pro;

Xaa at position 85 is Ile, Leu, Arg, Asp, Val, Pro, Gln,

10 Gly, Ser,\Phe, or His;

Xaa at position 86 is Mys, Tyr, Leu, His, Arg, Ile, Ser, Gln, Pro;

Xaa at position 87 is Asp, Pro Met, Lys, His, Thr, Val,

Tyr/Glu, Asn, Ser, Ala Gly, Ile, Leu or Gln;

Xaa at position 88 is Gly, Leu, Glu, Lys, Ser, Tyr, or Pro;

15 Xaa at position 89 is Asp, or Ser;

Xaa at position 90 is Trp, Val, Cys, Wr, Thr, Met, Pro,

Led, Gln, Lys, Ala, Phe, of Gly;

Xaa at position 91 is Asn, Pro, Ala, Phe Ser, Trp, Gln,

Tyr,\Leu, Lys, Ile,\Asp, or\H\s;

20 Xaa at position % is Glu, Ser, Ala, Lys, thr, Ile, Gly, or Pro;

Xaa at position 94 is Arg, Lys, Asp, Leu, Thr, Ile, Gln,

His, Set, Ala, or Pro

Xaa at position 95 is Arg, Thr, Pro, Glu, Tyr Leu, Ser, or Gly;

Xaa at position 96 is tys, Asn, Thr Leu, Gln, Arg,

25 His, Glu, Sex, Ala or Trb

Xaa at position 97 is Leu, Ne, Arg, Asp, or Met

Xaa at position 98 is Thr, Val, Gln, Tyr, Glu, His, Ser, or Phe;

Xaa at position 99 is Phe, Ser, Cys, His, Gly, Trp, Tyr,

Asp, Lys, Leu, Ile, Val or Asn;

30 Xaa at position 100 is Tyr, Cys, His, Ser, Trp, Arg, or Leu;

Xaa at position 101 is Leu, Asn, Val, Pro Arg, Ala, His,

Thr, Trp, or Met;

Xaa at position 102 is Lys, Leu, Pro, Thr, Met, Asp, Val,

Glu, Arg, Trp, Ser, Asn, His, Ala, Tyr, Phe, Gln, or

35 Ile;

Xaa at position 103 is Thr, Ser, Asn, Ile, Trp, Lys, or Pro;
Xaa at position 104 is Leu, Ser, Pro, Ala, Glu, Cys, Asp, or Tyr;

Xaa at position 105 is Glu, Ser, Lys, Pro, Leu, Thr, Tyr, or Arg; Xaa at position 106 is Asn, Ala, Pro, Leu, His, Val, or Gln; Xaa at position 107 is Ala, Ser, Ile, Asn, Pro, Lys, Asp, or Gly; Xaa at position 108 is Gln, Ser, Met, Trp, Arg, Phe, Pro,

5 His, Ile, Tyr, or Cys;

Xaa at position 109 is Ala, Met, Glu, His, Ser, Pro, Tyr, or Leu;

wherein from 4 to 44 of the amino acids designated by Xaa are different from the corresponding native amino acids of (1-133) human interleukin-3;

R2 is a hematopoietic growth factor; and

L is a linker capable of Linking R1 to R2;

and said chimera protein can additionally be preceded by (methionine 1), (alanine 1), or (methionine 2, alanine 1); and

- (c) transducing DNA into said cultured cells;
- (d) harvesting said transduced cells; and
- (e) transplanting said transduced cells into said patient.
- 25 38. A method of human gene therapy, comprising the steps of;
- (a) removing stem cells from a patient or a donor (b) culturing said stem cells with a selected growth medium comprising a chimera protein having the formula selected from the group consisting of:

 R_1-L-R_2 , R_2-L-R_1 , R_1-R_2 , R_2-R_1 , $R_1
ightharpoonup L-R_1$ and R_1-R_1

35 wherein R_1 is a human interleukin-3 mutant polypeptide of SEQ ID NO:7

wherein m is \Diamond or 1; Xaa at position 18 is Asn or Ile; Xaa at position 19 is Met, Ala or Ile; Xaa at position 20 is Ile, Pro or Leu; Xaa at position 23 is Ile, Ala or Leu; Xaa at position 25 is Thr or His; Xaa at position 29 is Gln, Arg, Val or Leu; Xaa at position 32 5 is Leu, Ala, Asn or Arg; Xaa at position 34 is Leu or Ser; Xaa at position 37 is Phe, Pro, or Ser; Xaa at position 38 is Asn or Ala; Xaa at position 42 is Gly, Ala, Ser, Asp or Asn; \Xaa at position 45 is Gln, Val, or Met; Xaa at position 46 is Asp or Ser; Xaa at 10 position 49 is Met, Ile, Let or Asp; Xaa at position 50 is Glu or Asp; Xaa at position 51 is Asn Arg or Ser; Xaa at position 55 #s Arg \setminus Leu, \Diamond r Thr; Xaa at position 56 is Pro or Ser; Xaa at position \$9 is Glu or Leu; Xaa at position 60 is Ala or Set; Xaa at position 62 is 15 Asn, Val or Pro; Xaa at position 63 \ Arg or His; Xaa at position 65 is Val or Ser; Xaa at position 67 is Ser, Asn, His or Gly; Xaa at\positi ϕ n\69 is Gln or Glu; Xaa at position 73 is Ala or Gly; Xaa at position 76 is Ser, Ala or Pro: Xaa at position 79 is Lys, Arg 20 or Ser; Xaa at position 82 is Leu, Glu, Val or Trp; Xaa at position 85 is Leu dr Val; Xala at position 87 is Leu, Ser, Trp; Xaa at position 88 is/Ala of Trp; Xaa at position 91 is Ala or Prox Xaa at position 93 is Pro or Ser; Xaa at position 95 is Nis or Thr; Xaa at position 25 98 is His, Ile, or Thr; Xaa at posttion 100 is Lys or Arg; Xaa at position 101 is Asp, Ala or Met; Xaa at position 105 is Asn or Gln; Xaa at position 109 is Arg, Glu or Leu; Xaa at position 112 is Thr or Gln, Xaa at position 116 is Lys, Val, Trp or Ser Xaa at position 30 117 is Thr or Ser; Xaa at position 120 is Asn, Gln, or His; Xaa at position 123 is Ala or $Gl\psi$; with the proviso that from four to forty-four of the amino acids designated by Xaa are different from the corresponding amino acids of native human interleukin-3; 35

R2 is a hematopoietic growth factor; and

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L is a linker capable of Linking R_1 to R_2 ; and said chimera protein can additionally be preceded by (methionine 1), (alanine 1), or (methionine 2, alanine 1); and

- (c) transducing DNA into said cultured cells;
- (d) harvesting said transduced cells; and
- (e) transplanting said transduced cells into

10 said patient.

39. A method of human gene therapy, comprising the steps of;

15 (a) removing stem cells from a patient or a donor;

(b) culturing said stem cells with a selected growth medium comprising a chimera protein having the formula selected from the group consisting of:

 R_1-L-R_2 , R_2-L-R_1 , R_1-R_2 , R_2-R_1 , R_1-L-R_1 and R_1-R_1

wherein R1 is a human interleukin-3 mutant polypeptide of

wherein R_1 is a human interleukin-3 mutant polypeptide of SEQ ID NO:8

wherein m is 0 or 1; n is 0 or 1; p is 0 or 1; Xaa at position 4 is Asn or Ile; Xaa at position 5 is Met, Ala or Ile: Xaa at position 6 is Ile, Pro or Leu; Xaa at position 9 is Ile, Ala or Leu; Xaa at position 11 is Thr or His; Xaa at position 15 is Gln, Arg, Val or Leu; Xaa at position 18 is Leu, Ala, Asn or Arg; Xaa at position 20 is Leu or Ser; Xaa at position 23 is Phe, Pro, or Ser; Xaa at position 24 is Asn or Ala; Xaa at position 28 is Gly, Ala, Ser, Asp or Asn; Xaa at

position 31 is Gln, Val, or Met; Xaa at position 32 is Asp or Ser; Xaa at position 35 is Met, Ile, Leu or Asp; Xaa at position 36 is Glu or Asp; Xaa at position 37 is Asn, Arg or Ser; Xaa at position 41 is Arg, Leu, or Thr; Xaa at position 42 is Pro or Ser; Xaa at position 45 is Glu on Leu; Xaa at position 46 is Ala or Ser; Xaa at position 48 is Asn, Val or Pro; Xaa at position 49 is Arg or His \ Xaa at position 51 is Val or Ser; Xaa at position 53 is\Ser, Asn, His or Gly; Xaa at position 55 is Gln or Glu; Xaa at position 59 is Ala or Gly; Xaa at 10 position 62 is Ser, Ala or Pro; Xaa at position 65 is Lys, Arg or Ser, Xaa at position 67 is Leu, Glu, or Val; Xaa at position 68 % Leu, Glu, Val or Trp; Xaa at position 71 is Leu or Val Xaa at position 73 is Leu, Ser or Trp; Xaa at position 74 is Ala or Trp; Xaa 15 at position 77 is Ala or Pro; kak at position 79 is Pro or Ser; Xad at position 81 is His or Thr; Xaa at position 84\is His, Ile, or Thr\\Xa\a at position 86 is Lys or Arg; Xaa at position 87 is Asp, Ala or Met; Xaa at position 1 is Asn or Glu; Xaa at position 95 is 20 Arg, Glu, Leu; Xaa at position 98 Thr or Gln; Xaa at position 102 is Lys, Val, Trp or Ser, Xaa at position 103 is Thr or Sex; Xaa at position 106 is Asn, Gln, or His; Xaa at position 109 is Ala or Glu; with the proviso that from four to forty-four of the amino acids 25 designated by Xaa are different/from the corresponding amino acids of native (15-125) human interleukin-3;

R2 is a hematopoietic\growth factor; and

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L is a linker capable of Linking R_1 to R_2 ; and said chimera protein can additionally be preceded by (methionine $^{-1}$), (alanine $^{-1}$), or (methionine $^{-2}$, alanine $^{-1}$); and

- (c) transducing DNA into said cultured cells;
- (d) harvesting said transduced cells; and

(e) transplanting said transduced cells into said patient.

40. The method according to claim 39 wherein 5 R1 is selected from the group consisting of:

Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys Arg Pro Pro Ala Pro Deu Leu Asp Pro Asn Asn Leu Asn Ala Glu Asp Val Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Asn Leu Glu Asn Leu Glu Asn Asn Leu Fro Cys Leu Pro Leu Ala Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln Gln SEQ ID NO:9;

Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn Ser
Glu Asp Met Asp Ile Leu Met Glu Asn Leu Arg Arg Pro
Asn Leu Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn
Ala Ser Ala Ile Glu Ser Ile Leu Lys Asn Leu Pro Cys
Leu Pro Leu Ala Thr Ala Ala Pro Thr Arg His Pro Ile His
Ile Lys Asp Gly Asp Tro Asn Glu Phe Arg Arg Lys Leu Thr
Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln Gln SEQ

ID NO:10;

Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
Val Pro Pro Ala Pro Leu Leu Asp Ser Asn Asn Leu Asn Ser
Glu Asp Met Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro
Asn Leu Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn
Ala Ser Ala Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys
Leu Pro Leu Ala Thr Ala Ala Pro Thr Arg His Pro Ile His
Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg Arg Lys Leu Thr
Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln Gln SEQ

35 ID NO:11;

Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp Gln Asp Tle Leu Met Glu Arg Asn Leu Arg Leu Pro Asn Leu Leu Ala Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Ala Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln Gln SEQ ID NO:12;

- Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp Gln Asp Ile Leu Met Glu Arg Asn Leu Arg Leu Pro Asn Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Ala Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln Gln SEQ ID NO:13;
- Asn Cys Ser Asn Met Tle Asp Glu Ile Ile Thr His Leu Lys Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp Gln Asp Ile Leu Met Glu Arg Asn Leu Arg Thr Pro Asn Leu Leu Ala Phe Val Arg Ala Val Lys His Leu Glu Asn Ala Ser Ala Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln Gln SEQ ID NO:14;
- Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln Gln SEQ

ID NQ:15;

Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln Gln SEQ ID NO:16;

Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu The Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln Gln SEQ ID NO:17;

Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Ser Leu Glu His Ala Gln Glu Gln Gln SEQ ID NO:18;

Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys

Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys Ala G $\dot{
m l}$ $\dot{
m l}$ Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val\Thr Leu Glu Gln Ala Gln Glu Gln SEQ ID NO:19;

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Asn Cys Ser Asn Met lle Asp Glu Ile Ile Thr His Leu Lys Gln Pro Pro Leu Pro\Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu Pro Ser Ala Thr Ala\Ala Pro Ser Arg His Pro Ile Thr Ile Lys Ala Gly Asp Trp Gln Glu Rhe Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln SEQ ID NO:20;

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Asn Cys Ser Asn Met Tle Asp Glu Ile Ile Thr His Leu Lys Gln Pro Pro Leu Pro Leu Leu Asp Phe Ash Asn Leu Asn Gly Glu Asp Gln Asp Ile Leu Met Glu Asn Ash Leu Arg Arg Pro Asn Leu Glu Ala Phe Asn Arg Ala Val Lys Sen Leu Gln Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Ash Leu Val Pro Cys 20 Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Ser Leu Glu His Ala Gin Glu Gln Gln SEQ ID NO:21;

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Asn Cys Ser Ile Met Ile Asp Glu Ile | Ile His His Leu Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Leu Asn Ala Glu Asp Val Asp Ile Leu Met Glu Arg Asn Leu Arg Leu Pro Asn Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Ala Ile Glu Ser Ile Leu Lys Ash Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg\Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln Gln SEQ ID NO:22;

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Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His Leu Lys Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Ash Leu Asn Ser Glu Asp Met Asp tle Leu Met Glu Arg Asn Leu Arg Thr Pro Asn Leu Leu Ala Phe Val Arg Ala Val Lys His Leu Glu Asn Ala Ser Ala Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln Gln SEQ ID NO:23;

Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys

Val Pro Pro Ala Pro Leu Leu Asp Ser Asn Asn Leu Asn Ser

Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Leu Pro

Asn Leu Leu Ala Phe Val Arg Ala Val Lys Asn Leu Glu Asn

Ala Ser Ala Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys

Leu Pro Leu Ala Thr Ala Ala Pro Thr Arg His Pro Ile His

Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg Arg Lys Leu Thr

Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Gln SEQ

ID NO:24;

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His

20 Leu Lys Gln Pro Pro Deu Pro Leu Leu Asp Phe Asn Asn Leu
Asn Gly Glu Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg
Arg Pro Asn Leu Glu Ala Phe Asn Arg Ala Val Lys Ser Leu
Gln Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln
Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro

25 Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys
Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
Gln SEQ ID NO:25;

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His

10 Leu Lys Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu
Asn Gly Glu Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg
Arg Pro Asn Leu Glu Ala Phe Asn Arg Ala Val Lys Ser Leu
Gln Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Val
Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro

11 Ile Thr Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys
Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
Gln SEQ ID NO:26;

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Met Ala Asn\Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys Gln Rro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Let Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser\Gly Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Ser Leu Glu His Ala Gln Glu Gln Gln SEQ ID NO:27;

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn Ala Gu Asp Val Asp\Ile Leu Met Glu Arg Asn Leu Arg Leu Pro Asn Leu Glu Ser the Val arg Ala Val Lys Asn Leu 15 Glu Asn Ala Ser Ala Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys Thr\Leu Glu \Asn Ala Gln Ala Gln Gln SEQ ID NO\28; 20

Met Ala Asn Cys \ser Ile Met I\delta e \set Asp Gl\dagger Ile His His Leu Lys Arg Pro Pro Asn Pro Let Leu Asp Pro Asn Asn Leu Asn Ser Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr Pro Asn Leu Leu Ala Phe Val Arg Ala Val Lys His Leu Glu Asn Ala Ser Ala Ile Glu Ser tle Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Gl Asn Ala Gln Ala Gln Gln SEQ ID NO:29; 30

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys Val Pro Pro Ala Pro Leu Leu Asp Ser Asn Asn Leu Asn Ser Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Leu Pro Asn Leu Leu Ala Phe Val Arg Ala Val Lys Asn Leu 35 Glu Asn Ala Ser Ala Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro Thr Arg His Pro

Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln Gln SEQ ID NO:30;

- Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His
 Leu Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu
 Asn Ala Glu Asp Val Asp Ile Leu Met Glu Arg Asn Leu Arg
 Leu Pro Asn Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu
 Glu Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln
 Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro
 Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys
 Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
 Gln SEQ ID NO:31;
- Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His
 Leu Lys Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu
 Asn Ser Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg
 Thr Pro Asn Leu Leu Ala Phe Val Arg Ala Val Lys His Leu
 Glu Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln
 Clu Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro
 Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys
 Leu Thr Phe Tyr Leu Val Thr Leu Glu Cln Ala Gln Glu Gln
 Gln SEQ ID NO:32;
- Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Leu Lys Val Pro Pro Ala Pro Leu Leu Asp Ser Asn Asn Leu Asn Ser Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Leu Pro Asn Leu Leu Ala Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln Glu Gln Gln SEQ ID NO:33;
 - Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn Ala Glu Asp Val Asp Ile Leu Met Glu Arg Asn Leu Arg

Leu Pro Asn Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys\Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln Gln SEQ ID NO:34;

Met Ala Asn Cys Ser\Ile Met Ile Asp Glu Ile Ile His His Leu Lys Val Pro Pro Ala Pro Leu Leu Asp Ser Asn Asn Leu Asn Ser Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg 10 Leu Pro Asn Leu Leu Ala Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys Ala Gly Asp Trp Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln 15 Gln SEQ ID NO 35;

Met Ala Asn Cys\Ser Ile Met\Ile Asp | u Ile Ile His His Leu Lys Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn Ser Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg 20 Thr Pro Asn Leu Let Ala Phe Val Arg Ala Val Lys His Leu Glu Asn Ala Ser Gly le Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys Ala Gly Asp Trp Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Ser Leu Glu His Ala Gln Glu Gln 25 Gln SEQ ID NO:36;

Met Ala Asn Cys Ser Ile Met Ile Asp\Glu Ile \tag{le His His Leu Lys Val Pro Pro Ala Pro Leu Leu Asp Ser Asn Asn Leu Asn Ser Glu Asp Met Asp Ile Leu Met Glu Arg Ash Leu Arg 30 Leu Pro Asn Leu Leu Ala Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Ser Leu Glu His \Ala Gln Glu Gln 35

Gln SEQ ID NO:37;

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Leu Lys Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asp Thr Pro Asn Leu Leu Ala Phe Val Arg Ala Val Lys His Leu Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Glu Asp Arg Ala Usu Lys His Pro Ile Thr Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys Leu Glu Thr SeQ ID NO:38;

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Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn Ala Glu Asp Val Asp Ile Leu Met Glu Arg Asn Leu Arg Leu Pro Asn Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Ser Leu Glu His Ala Gln Glu Gln Gln SEQ ID NO: \$9;

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Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn Ala Glu Asp Val Asp Ile Leu Met Asp Arg Asn Leu Arg Leu Ser Asn Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln Glu Gln Gln SEQ ID NO:40;

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Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ala Ile His His
Leu Lys Arg Pro Pro Ala Pro Ser Leu Asp Pro Asn Asn Leu
Asn Asp Glu Asp Met Ser Ile Leu Met Glu Arg Asn Leu Arg
Leu Pro Asn Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu
Glu Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln
Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro
Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys

Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln Gln SEQ ID NO:41;

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His

Leu Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu
Asn Asp Glu Asp Met Ser Ile Leu Met Glu Arg Asn Leu Arg
Leu Pro Asn Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu
Glu Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln
Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro

Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys
Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
Gln SEQ ID NO 42;

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His

Leu Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu
Asn Ala Glu Asp Val Asp Ile Leu Met Asp Arg Asn Leu Arg
Leu Pro Asn Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu
Glu Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln
Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro

Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys
Leu Thr Phe Tyr Leu Val Thr Neu Glu Gln Ala Gln Glu Gln
Gln SEQ ID NO: 48;

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile His His
Leu Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu
Asn Asp Glu Asp Val Ser Ile Leu Met Glu Arg Asn Leu Arg
Leu Pro Asn Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu
Glu Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln
Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro
Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys
Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
Gln SEQ ID NO:44;

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn Asp Glu Asp Met Ser Ile Leu Met Glu Arg Asn Leu Arg

Leu Pro Asn Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ilys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln Glu Gln SEQ ID NO: 45;

Met Ala Tyr Pro Glu Thr Asp Tyr Lys Asp Asp Asp Asp Lys
Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
10 Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn Ala
Glu Asp Val Asp Ile Leu Met Glu Arg Asn Leu Arg Leu Pro
Asn Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn
Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys
Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile
15 Ile Lys Ala Gly Asp Trp Gln Glu Rhe Arg Glu Lys Leu Thr
Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln Gln SEQ
ID NO:46;

Met Ala Tyr Pro Glu Thr Asp Tyr Lys Asp Asp Asp Asp Lys
20 Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn Ser
Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr Pro
Asn Leu Leu Ala Phe Val Arg Ala Val Lys His Leu Glu Asn
Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys
Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile
Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr
Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln Gln SEQ
ID NO: 47; and

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Leu Ile His His
Leu Lys Ile Pro Pro Asn Pro Ser Leu Asp Ser Ala Asn Leu
Asn Ser Glu Asp Val Ser Ile Leu Met Glu Arg Asn Leu Arg
Thr Pro Asn Leu Leu Ala Phe Val Arg Ala Val Lys His Leu
Glu Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln
Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro
Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys
Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln

Gln SEQ ID NO:48.

41. The method of claim 36, 37, 38, 39, or
40 wherein is R₂ is R₁ or a hematopoietic growth factor
5 selected from the group consisting of: GM-CSF, CSF-1,
G-CSF, G-CSF Ser¹⁷, c-mpl ligand (MGDF or TPO), M-CSF,
erythropoietin (EPO), IL-1, IL-2, IL-3, IL-4, IL-5, IL6, IL-7, IL-8, IL-9, IL-10, IL-11, IL-12, IL-13, IL-15,
IL-16, LIF, flt3 ligand, human growth hormone, B-cell
growth factor, B-cell differentiation factor,
eosinophil differentiation factor and stem cell factor
(SCF);

The method of claim 41 wherein is R₂ is selected from the group consisting of G-CSF, G-CSF Ser¹⁷, flt3 ligand or c-mpl ligand.

43. The method of claim 37 wherein said chimera protein is selected from group consisting of:
20 SEQ ID NO:121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 165, 166, 167 and 168.

44. The method of claim 43 wherein said chimera protein is selected from group consisting of: SEQ ID NO:124, SEQ ID NO:133, SEQ ID NO:154 and SEQ ID NO:155.

45. The method of claim 37, 38, 39, 40, or 63 wherein said culture medium further comprises a hematopoietic growth factor selected from the group consisting of: GM-CSF, CSF-1, G-CSF, G-CSF Ser¹⁷, c-mpl ligand (MGDF or TPO), M-CSF, erythropoietin (EPO), IL-1, IL-4, IL-2, IL-5, IL-6, IL-7, IL-8, IL-9, IL-10, IL-11, IL-12, IL-13, IL-15, IL-16, LIF, flt3 ligand, human

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growth hormone, B-cell growth factor, B-cell differentiation factor, eosinophil differentiation factor and stem cell factor (SCF).

46. The method of claim 41 wherein said culture medium further comprises a hematopoietic growth factor selected from the group consisting of: GM-CSF, CSF-1, G-CSF, G-CSF er^{17} , c-mpl ligand (MGDF or TPO), M-CSF, erythropoietin (EPO), IL-1, IL-4, IL-2, IL-5, IL-6, IL-7, IL-8, IL-9\ Ib-10, IL-11, IL-12, IL-13, IL-10 15, IL-16, LIF, flt3 ligand, human growth hormone, Bcell growth factor, B-cell differentiation factor, eosinophil differentiation factor and stem cell factor (SCF).

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- 47. The method of claim 42 wherein said culture medium further comprises a hematopoietic growth factor selected from the group consisting of: GM-CSF, CSF-1, G-CSF, G-CSF Ser¹⁷, c-mpl ligand (MGDF or TPO), M-CSF, erythropoietin (EPO), I_L-1 , I_L-4 , I_L-2 , I_L-5 , 20 IL-6, IL-7, IL-8, 1\(\frac{1}{4}\)-9, IL-10, \(\IL\)-11, IL\\(\frac{1}{12}\), IL-13, IL-15, IL-16, LIF, flt3\ligand, human growth\hormone, Bcell growth factor, B\cell different ation factor, eosinophil differentiation factor and stem cell factor (SCF). 25
 - 48. The method of claim 36 wherein said mutant human interleukin-3 polypeptide has at least three times greater activity than native human interleukin-3, in at least one assay\selected from the group consisting of: AML cell proliferation, TF-1 cell proliferation and Methylcellulose assay.
 - 49. The method of claim 41 wherein said mutant human interleukin-3 polypeptide has at least 35 three times greater activity than native human interleukin-3, in at least one assay selected from the

group consisting of: AML cell proliferation, TF-1 cell proliferation and Methylcellulose assay.

- 50. The method of claim 36 further comprising the step of separating the stem cells from a mixed population of cells prior to culturing the stem cells.
- 51. The method of claim 50 wherein said stem cells are separated from a mixed population of cells based on the stem cells having CD34 surface antigen.
 - 52. Transduced stem cells obtained by the method of claim 36.
- 53. Transduced stem cells obtained by the method of claim 41
 - 54. Transduced stem cells obtained by the method of claim 49.

